THE OLD TIMER'S BULLETIN

OFFICIAL JOURNAL, ANTIQUE WIRELESS ASSOCIATION, INC.

Published for the Collector, Historian and Old Time Wireless Operator

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ANNUAL CONFERENCE
September 2-5, 1998
Featuring: Zenith
See special insert inside

Cover photo
See page 3

Photo courtesy Zenith Electronics Corp.

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"THE OLD TIMER'S BULLETIN" — THE AWA JOURNAL

Bruce L. Kelley 1914-1997, Founding Editor

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Financial reports: Dexter Deeley (Treasurer), 8 Briar Circle, Rochester, NY 14618, (716) 381-9633.

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ON THE COVER

Actress Irene Hervey poses with Zenith *Stratosphere*, which sold for about $750.00 in 1935. "Big Black Dial" feature was introduced that year. (*Photo and information courtesy Zenith Electronics Corporation.*)

See You In Rochester?

President Fizette (whose message will be found over on the facing page) has already done a great job of encouraging and persuading you to attend our exciting September meet. By the time you receive this issue, it will be just a scant few weeks away. I'm looking forward to Rochester, as always, and am already making lists of flea-market wants, friendships to be renewed, trades to be consummated, and programs I MUST attend.

Also high on my agenda, as it was last year, is chatting with as many of the Rochester attenders as would like to meet with me and swap ideas about the *OTB*'s past present and future. Check the bulletin board by the registration desk. I'll post specific times and a location (very likely in the Book Fair area) when and where I can be found. Of course I'm also fair game if you come upon me by chance in the hallways or the flea market. Looking forward to it!

Mackiewicz Collection to Remain Intact

Most *OTB* readers enjoyed Dick Mackiewicz's "Headsets" column and knew of his long-standing commitment to collect and document an example of every make and model of headset ever made. Now that he has passed on, many of you may be wondering if his collection has been dispersed and his work left unfinished. Not so! Stewardship of the collection and Dick's unfinished book has passed to close friends, who plan to keep the collection intact and continue the book project where Dick left off. For my part, I intend to publish a consolidated version of Dick's comprehensive headset listing, which originally appeared in the *OTB* a few years ago as a feature article, and was updated a couple of times in subsequent "Headsets" columns.

Complete John Bardeen Talk Now on Hand

Thanks to all the readers who responded to my request for help with interpreting the audio-tape transcription of John Bardeen's 1986 AWA Conference presentation! It seems that the transistor co-inventor had previously given an identical talk at the University of Illinois and a few copies of this, complete with all overhead projector graphics, were available as handouts at the AWA presentation. Past AWA President Bruce Roloson had a copy, autographed and presented to him by Bardeen himself. Bruce's wife Debbie happened to notice the request in my editorial last month, remembered Bruce's copy, and called it to his attention. We're now in the process of securing permission to reprint the talk in a forthcoming *OTB.*

Writing for the OTB

The sharp-eyed among you may have already noticed that this issue is a little larger than usual. When I first became editor of the *OTB*, I increased the page count to 68 (previous issues had averaged 10-20 pages smaller) in order to handle a number of articles awaiting publication. Since then the *OTB* has remained at 68 pages, and the influx of new submissions has just about offset the outgo of published ones.

For the first time, I've noticed an increase in the number of publishable new articles on hand and, after consulting with the purse-strings folks, we decided to make this issue a bit bigger to avoid building up an unwieldy backlog. I don't know if this is a trend, and of course there's a financial limit to how big we can get. However, as Editor, I'm flattered at what appears to be an increasing realization of the value of being published on these august pages!

Perhaps this is a good time to review a few guidelines for writing for the *OTB*. As far as content is concerned, we'll consider anything and everything relating to the history of wireless and radio. I really don't want to place any content constraints in the way of our potential authors. I do, of course, look for lucid, well-organized and well-illustrated presentations. Ideally, I'd like to have at least one illustration (diagram, schematic, photo or other graphic) for each published page. More, if possible. Of course, I'll always try to make exceptions for worthy material that is not well-illustrated. And sometimes, I'm able to add a supplementary illustration or two from my own library.

As far as length is concerned, 2,000 words — or about four published pages — is a good comfortable size for us. Again, we're ready to make exceptions when appropriate. But we're a small-format publication, and a quarterly one at that. Really large articles easily upset our editorial balance! Yes, we can break up longer articles into parts, and we don't hesitate do that when necessary. But if you have a lot of material to write on a given topic, and it's possible to pre-

THE PRESIDENT'S MESSAGE

Once again, shortly after you receive this *OTB*, our annual conference will begin in suburban Rochester, NY, amid the lakes and rolling hills of beautiful upstate New York. We hope that you will make it a point to attend at least some of the events. Events? Yes, we have a lot of them. The Annual AWA Conference is much more than a "flea market," which unfortunately, is all that it means to a large number of attendees.

Yes, we do have a flea market, and it is a good one, and it runs continuously for at least three days. But elsewhere a great deal more is taking place. Inside the hotel, you will find an extensive offering of some fourteen historical and general interest programs. These begin on Wednesday afternoon and run almost continuously through Saturday. Included among them, for the hardware and software buffs who are by Thursday tired of the outside commotion, are two major auctions.

More? Certainly. The conference theme this year is Zenith, and the annual contest, chaired by Geoff Bourne and Ralph Williams, is sure to bring forth some stunning entries. Further on Zenith, we have a presentation on Zenith transistor radios by columnist Norm Smith and another on the Zenith windchargers for farm radios of the 1930s.

Among the general-interest programs are a presentation by Bart Lee on short-wave history, a seminar for telegraph key collectors (what, you don't have any keys?) with some of the world experts in attendance to answer your questions, a demonstration of the flying spot color scanner, a discussion of the UV199 tube for the tube buffs, a talk about Loomis for those who wonder who actually started it all, one by Bob MacIntyre on restoration, and considerably more.

Your conference committee members have, as usual, gone to considerable pains to assure that you will have a pleasurable, and hopefully care-free, few days of total immersion in our fascinating hobby. And we once more expect attendees from all over the world.

The hotel staff concentrates on our group for the duration of the conference, and we expect that they will do their usual superb job as our hosts. What have you got to lose? If you have never attended a conference, try to get to Rochester for at least part of it. And be sure to make your reservations early....the hotel does fill up quickly.

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sent it as two or more free-standing articles rather than a single long one, please take that route!

If you have access to black-and white processing where you live, please shoot your photographs in black-and-white. Color will work if black-and white isn't practical for you, but try to make your pics as technically good as possible. Muddy prints, or shots with shadow detail obscured by harsh lighting won't look any better on the *OTB* pages than they do in your living room. If you are shooting indoors and can control the lighting, avoid shadows by bouncing your flash or floodlights off the ceiling. This is a great "quick and dirty" way to get luminous tabletop photographs.

It's worth the work to arrange for a plain background for your equipment close-ups. A sheet thrown over a chair doesn't make it, even if you have crumpled it artistically here and there! And while your lavatory floor may have an interesting tile pattern, it will definitely be a distraction for those trying to study and enjoy your 1929 breadboard regenerative. By the way, no need to worry about sending us 8 × 10s. Standard snapshot sizes work fine.

Want to include a photo or advertisement from an old book or magazine (in the public domain, of course)? I'd love to borrow the publication so I can make the best possible scan, but I know that's not always possible. We can often get good reproduction from a photocopy, but we have the best chance at that if you have the copy done on a good machine. Instead of using a public copier with the inevitable dirty platen and toner splotches, find a copy store with a high-res copier behind the counter; those Kodak models are great. Have the copies done on that; it'll cost you just a few pennies more, and will make a world of difference at this end.

Schematics? A good clear hand-drawn one will be fine. We have three or four volunteers who will turn it into a thing of beauty on their drafting tables or computers. — MFE

AWA NEWS

OTB *Policy on Promoting Events*

The *OTB* is pleased to list the meets and meetings of any established antique radio organization, whether or not it is associated with the AWA. Do not send your information directly to the *OTB* Editor. Please send it to Joyce Peckham, Box E, Breesport, NY 14816. Closing date is six weeks prior to first day of month of issue.

CALENDAR OF AWA ACTIVITIES

August 8
Joint Meet With NFWA — Amherst, NY

September 2-5
Annual Conference, "Zenith"
(See special insert, this issue)

November 1
Annual Business Meeting

November 28-29
1929 QSO Party

December 5-6
1929 QSO Party

(see below for detailed information on meets)

CALENDAR OF MEETS

(AWA logo identifies AWA-sponsored events)

NIAGARA FRONTIER WIRELESS ASSOCIATION

August 8

Joint meet with the AWA and our largest of the year. At the Amherst Museum, Amherst, NY. From the NY State Thruway, take Exit 49 (Transit Rd., Rt. 78) north nine miles. Left on Tonawanda Creek Rd. Proceed two miles to the museum. 8 a.m. to noon. – flea market. 10:30 a.m. – museum opens. 11 a.m. – auction of more items from the estate of John Myers, plus donation auction. Contest categories: Insulators and Lightning Arresters; Cone Speakers; Homebrew Tube Sets (not kits); Novelty Radios Tube or Transistor; Open (anything radio related). Theme: 50 years of local (Buffalo) television. Bring along something to show in the display of early TV artifacts. Talk on early TV about 12:30. Entry fee $3.00. No extra charge to sell or for other activities. For info: Larry Babcock (716) 741-3082 or Gary Parzy (716) 668-2943.

CHRS FOOTHILLS COLLEGE SWAP MEETS

August 1 and November 7

Hosted by the California Historical Radio Society, these meets begin at 8 a.m. Take El Monte Blvd. west off Hwy. 280. Make a right turn into the campus. At the Outer Campus circle, turn right, go up the hill, and look for Parking Lot "D." (Note: this is a new lot; previous meets had been held in "T.") Auction; seller's fee applies. For more info on this and other regional meets call the CHRS HOTLINE: (415) 821-9800.

RADIOFEST XVII

August 5-8

Presented by Antique Radio Club of Illinois. Huge flea market, old equipment contest, auctions, awards banquet, presentations, radio repair clinic. Holiday Inn at Elgin, IL.(Exit I-90 at IL 31 South). Holiday Inn may undergo a name change prior to the meet, but this will not affect Radiofest XVII. For further information, write ARCI, P.O. Box 1139, La Grange Park, IL 60526 or e-mail jdiscip@aol.com.

LONDON-TORONTO ANNUAL COMBINED MEET

September 19

At Canadian Legion, 919 York Rd. (#7 Hwy. E) Guelph Ontario Canada. Flea market, auction, contests for pre-1925, 1926-1940 and 1941-1960 tube-type radios. 8 a.m. to 2 p.m; Hammond Museum open 2 p.m. to 5 p.m. Admission to all events, $2.00 per family. Vendor table or space, $5.00. For info contact Geoffrey [Ph/Fax (510) 638-2528]; e-mail Geoffrey.Maher@sympatico.ca; or set your browser to www.geocities.com/colosseum/4884.

SPARK "RAIN OR SHINE" MEET

November 7

The Society for Preservation of Antique Radio Knowledge, Inc. presents "Rain or Shine" #2, an annual indoor swap meet. Held at Huber Heights

Jaycee Hall, 4601 Chambersburg Rd., Huber Heights, OH. 7 a.m. to 11 a.m. Location is just north of Dayton, with easy access from I-75 and I-90. For info, reservations, directions call Harold Parshall (937) 268-2909 or Dan Gebhart (937) 299-9570 or e-mail sparkinc@juno.com.

RECURRING MEETINGS

• California Historical Radio Society — Sacramento Chapter meetings are held at 7.p.m. on the third Tuesday of each month in the SMUD Building, Corner of Elkhorn and Don Julio, in Sacramento. Quarterly swap meets at Foothills College, Los Altos Hills, CA (see *Calendar of Meets* section) For latest information on other meets and regional events, call the CHRS HOTLINE (415) 821-9800. Mailing address is CHRS, P.O. Box 31659, San Francisco, CA 94131.

• **Cincinnati Antique Radio Society** — Meets third Wednesday of each month. Eastgate Mall, SR32 & I-275. Community room in mall. For more information, contact Bob Sands, 513-858-1755 or Ted Lewis 937-446-3898.

• Carolinas Chapter of the AWA — Meets approximately bimonthly. For more information, Contact Ron Lawrence, President, P.O. Box 3015, Matthews, NC 28106-3015; phone (704) 289-1166.

• Central Ohio Antique Radio Assn. — Meets at 7:30 p.m., third Wednesday of each month at Devry Institute of Technology, 1350 Alum Creek Rd., Columbus (I-70 Exit 103B). Contact: Chuck/Sue Davis (614) 792-6237.

• **Delaware Valley Historic Radio Club** — This SE Pennsylvania club meets the second Tuesday of each month at North Penn Amusements, 105 Main St. (Rt. 113), Souderton. Membership $10/yr. For info: P.O. Box 41031, Philadelphia, PA 19127-0031, or Mike Koste (215) 646-6488.

• **Houston Vintage Radio Association** — Meets second Tuesday each month (except Jan. and Dec.) At Lai Lai Restaurant, Tides II Motel, Houston Medical Center, Main and Holcombe Sts., Houston, TX. Meetings include auction/program, 7-10 p.m. Assoc. publishes *Grid Leak* quarterly, monthly activity announcements. Membership $15/yr. Write: HVRA, P.O. Box 31276, Houston, TX 77231-1276, or call Richard Collins, (713) 778-0721.

• Hudson Valley Antique Radio & Phono Society — Meets third Thursday of month, 7 p.m. Meeting, swap meet, and membership info: Peter DeAngelo, President, HARPS, 25 Co. Rt. 51, Campbell Hall, NY 10916. (914) 496-5130.

• London Vintage Radio Club — This Ontario, Canada club meets in London on the last Saturday of January, March, May, June and November. Annual flea market held in Guelph, Ontario in September in conjunction with the Toronto club. Contact: Lloyd Swackhammer, VE3IIA, RR#2, Alma, Ontario, Canada. (519) 638-2827.

• Mid-Atlantic Antique Radio Club — Meets monthly, usually at New Hope Seventh Day Adventist Church, Burtonsville, MD, Saturdays or Sundays, depending on time of year. Contacts: President Ed Lyon, 11301 Woodland Way, Myersville, MD 21773-9133, (301) 293-1773, or Membership Chairperson Jay Kiessling (410) 239-1818.

• **New Jersey Antique Radio Club** — Meets second Friday each month, 7:30 p.m. Holds three annual swap meets. Contact (send SASE): Tony Flanagan, 92 Joysan Terr., Freehold, NJ 07728, (908) 462-6638.

• Northwest Vintage Radio Society — Meets second Saturday of each month (except July and August), at or about 10 a.m., at the Buena Vista Club House at 16th and Jackson streets in Oregon city, Oregon. Members display radios, exchange information. Guests welcome at all meetings and functions, except board meetings. For info, write the Society at P.O. Box 82379, Portland, Oregon 97282-0379.

• **Oklahoma Vintage Radio Collectors** — Meets second Saturday each month, Spencer's Barbecue Restaurant, NW 63rd and May Avenue, Oklahoma City. Dinner/socializing, 6 p.m.; meeting at 7 p.m. Membership, $12/yr., includes monthly *Broadcast News*. Info: SASE to OKVRC, P.O. Box 72-1197, Oklahoma City, OK 73172-1197, or call (405) 722-0595 or (405) 755-4139 eves.

• **Ottawa Vintage Radio Club** — Meets monthly (except June and July) in Conference Room, Ottawa Citizen, 1101 Baxter Rd., Ottawa, Ontario. Contact: Tom Devey, 601-810 Edgeworth Ave., Ottawa, ON K2B 5L5, (613) 828-5152. Membership: $10 Canadian/yr.

• Society for Preservation of Antique Radio Knowledge — Meets at 7:30 p.m., fourth Tuesday of each month in the party room at Cassano's Pizza Parlor, 1700 East Stroop Rd., Kettering, OH. Membership, $12/year. Write PO Box 482, Dayton, OH 45449; e-mail sparkinc@juno.com; or call Dan Gebhart (937) 299-9570.

• **Texas Antique Radio Club** — New club forming in San Antonio area. Meeting dates to be announced. Contact: Joe Koester, President TARC, 7111 Misty Brook, San Antonio, TX 78250-3498. (210) 522-1662.

SERVICE SOURCES AVAILABLE

The AWA Source Sheet is a listing of parts suppliers and services for the radio collector. Cost: only a business-size self-addressed stamped envelope to AWA, Box E, Breesport, NY 14816.

AWA SLIDE/VIDEO PROGRAM

The Antique Wireless Association has available several historical documentaries to loan to affiliated organizations for club meetings and programs. There is no charge for this service other than return mailing cost. For info on loan conditions, to make reservations, or just inquire, contact Richard Ransley, P.O. Box 41, Sodus, NY 14551. The following are available:

VHS Video Programs

V-2 — "Electrons on Parade." 18 min. 1938 movie made at RCA's Harrison Plant showing production lines with closeups showing receiving tubes, including a short sequence on transmitting tubes. (Very rare movie.)

V-4 — "The British Receiver." Documentary of the AWA/BVPS meet with visit to Marconi's Chelmsford plant, the British Science Museum, and ending with series of collectible British receivers. (VHS program transferred from slides.)

V-5 — "The Early Years." Historical documentary narrated by Clarence Tuska telling of the early years of amateur radio, founding of the ARRL and WW I military radio training school. (VHS program transferred from slides.

V-6 — "The Key." History of the telegraph/radio key covering early hand keys, semi-automatics and commercial types. Script by Lou Moreau, W3WRE. (VHS program transferred from slides.)

V-9 — "The Transatlantic Tests and 1BCG." Rare documentary/photographs showing early amateur operation leading to famous 1921 transatlantic tests.

V-12 — "Those Wonderful Magazine Covers." The story of radio through magazine covers. Colorful with period music.

V-15 — "The WHAM Story." Details development of a pioneer radio station in Rochester, NY. Program developed with assistance and recollections of Art Kelly, the station's former general manager.

V-16 — "The Charles Herrold Story." Video prepared by Mike Adams who donated this copy to the AWA. It documents the work of broadcasting's Forgotten Father who started broadcasting in 1912.

Slide Programs

S-1 — "Portrait of a Pioneer." The life of Elmo Pickerill.

S-2 — "Polar Adventure." Pictures taken by Bud Waite and his narration describing numerous trips to the Antarctic over a 35-year period.

S-3 — "70 Years of Vacuum Tubes." Describes the history of vacuum tubes.

S-4 — "The Early Years." (See description for V-5.)

S-7 — "The Transatlantic Tests and 1BCG." (See description for V-9.)

S-8 — "Trip Through the AWA Museum" Covers exhibits and equipment.

S-12—"The Key." (See description for V-6.)

AWA NETS (EST)

PHONE:

SUN.:
7244 kHz, SSB, noon (NCS: WA4LAM); 3837 kHz, AM 4 p.m.(NCS's: W2ZM & W2AN)

TUES.:
14274 kHz SSB, 2:30 p.m. (NCS's KC3YE and W0FXY) 3837 kHz SSB, 8 p.m. (NCS N4FS)

MON.-WED.-FRI:
3867 kHz, 9:30 a.m. (NCS: W2SHN)

CW:
Daily, 4pm, 3588 or 7050 kHz. Protocol informal. Check both frequencies for activity and join in, or call AWA de (your call) and see what you stir up.
First Wed. of each month, 8 p.m., 7050 kHz

2-M REPEATER (Rochester Area)
Mon., 7:30 p.m. (NCS: W2ICE)
Receive 146.820 MHz;
Transmit 146.220 MHZ

LETTERS TO THE EDITOR

All letters to the Editor are read with interest and attention, though not all can be published in this column. Letters may be paraphrased, shortened or otherwise edited to fit the available space. The statements made by our correspondents are their own opinions and do not necessarily reflect the views of either the OTB *staff or the Antique Wireless Association.*

MORE MEMORIES OF BRUCE

I was very sorry to hear of Bruce Kelley's passing. I first met Bruce when a mutual acquaintance suggested that he could help me fire up a home-brew TRF 3-dialer I had found.

Bruce took me to his Holcomb carriage house and gave me some parts for the project, along with an application for AWA membership which he had personally signed off on. Then we went to the museum, where George Batterson started up the spark transmitter for a personal demonstration! Linc Cundall was also there that day. Later, I had the privilege of meeting Gioa Marconi Braga.

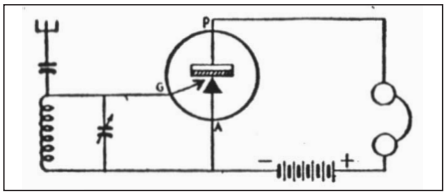
These are just a few of the fine people it was my pleasure to meet through that chance introduction to Bruce. He and they will be hard to replace.

JEFFREY KITZE
Lawrenceville, VA

GERNSBACK STRIKES AGAIN!

I enjoyed the May issue of the *OTB*, as I usually do all issues. But this one had something very special: the articles commemorating the 50th anniversary of the birth of the transistor. The articles brought to mind a prophetic article that appeared in the *Radio Craft* magazine for April, 1947 — just a bit over a year before the transistor's birth was announced. It was one of the famous "April Fool" pieces by "Mohammed Ulysses Fips, I.R.E., A.I.E.E."

In the piece "New! Crystron Lapel Radio," Fips announces that he has married vacuum tube and crystal detector technology by inserting a grid between the crystal and the cat's whisker. Fips explains that this new Crystron (crystal-electron) device required no "A" battery and could be used to miniaturize radio receivers and other electronic gear! In a later refinement of the Crystron, Fips reported depositing a speck of radioactive isotope on the tip of the cat's whisker — thus establishing an electron flow through the device using no batteries whatever!



"Simplest Crystron Circuit" from the Fips article. One wonders if the fictional inventor had a pipeline to Bell Labs!

ARGIRIOS L. ADAMIDIS, SV2DV
Thessaloniki, Greece

MAURICE MILLER NOTEBOOKS

A friend of mine has acquired a very few of the possessions of Maurice Miller, who was his relative. Among other things, Miller developed the altimeter trigger for the first A-bomb. (He had second thoughts about giving it to the government, and actually delayed the first test a few days.)

Mr. Miller lived near here in Latham, NY, and apparently had only an eighth-grade education.

Before an ignorant relative took most of his stuff to the dump, my friend salvaged two of his many notebooks and a small laboratory CRT-like device used to try out phosphors for color TV. It appears that Miller had his own glass-blowing facilities.

I have photocopied one of the notebooks, covering the period from November 22, 1946 to January 16, 1950. It details electron gun construction, glassworking, color phosphors, vacuum sealing, etc. My friend has another notebook and more information. We would be glad to pass the information on to anyone wishing to do research in this area.

CHUCK PORTER
porterc@crisny.org

CRATED BUT NOT PROTECTED

I recently sold a G.E. E-91 radio (large table model, approximately 1937 vintage) to a man in Indiana. I made what I thought was a very formidable crate with lots of packing all around. I even included hand grips on the side to lift with.

The crate arrived in one piece, however, there was a tragic flaw in the packing scheme…

The completed shipment weighed in at least 50 pounds.

The box arrived in one piece, but there was some serious internal damage I didn't expect. The speaker had been mounted directly on the thin plywood front panel, which didn't provide much support. When my customer opened the crate, he found that the speaker had broken loose in shipment and fallen back inside. Luckily, he felt he could repair the damage.

Using hindsight, I wish that I had (1) either removed the speaker and packed it separately or (2) reinstalled the speaker through a temporary sheet of thin plywood placed in front of the grill.

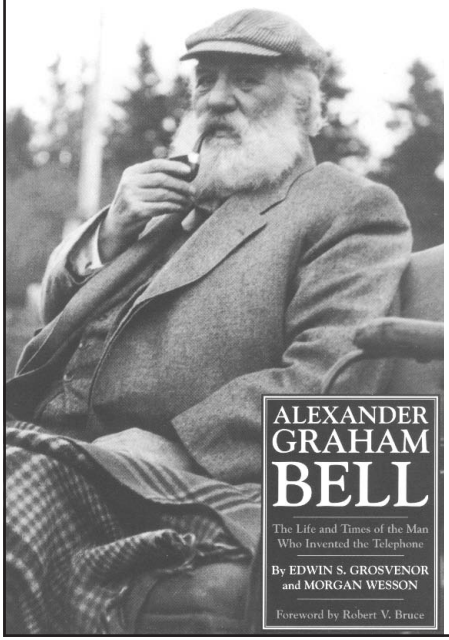
RAY LARSON
W. Los Angeles, CA

ALEXANDER GRAHAM BELL

A Book You'll Want to Own!

An important new illustrated biography of Alexander Graham Bell has just been released to coincide with the 150th anniversary of the inventor's birth. *Alexander Graham Bell* was written by AWA member Morgan Wesson in collaboration with Edwin S. Grosvenor, Bell's great-grandson.

The book chronicles the inventor's upbringing in Scotland, the family's emigration to Canada, and the young man's career as a teacher of the deaf in the Northeastern U.S. It follows this innovative man as, spurred by twin interests in acoustics and telegraphy, he begins to experiment with electrical communication.


ALEXANDER
GRAHAM
BELL
The Life and Times of the Man Who Invented the Telephone
By EDWIN S. GROSVENOR and MORGAN WESSON
Foreword by Robert V. Bruce

The dramatic story of the development of the telephone unfolds, and the work of competing inventors, including Thomas Edison and Elisha Gray, is put into perspective. Also discussed is Bell's later inventing career and his involvement with aviation, hydrofoils and the founding of the *National Geographic*.

The 8¾"×1¼" handsomely-printed hardbound book contains 304 pages. Its 400 illustrations include many published for the first time.

Emmy-award-nominated author Wesson is probably best known to *OTB* readers for his work, with Ken Burns, on the video documentary *Empire of the Air*. He has also written on the history of technology for *Encyclopaedia Britannica* and *Groliers* and served as a curator at The International Museum of Photography at George Eastman House.

Special Pricing For AWA Members

Through a special arrangement with the author, members can purchase this important illustrated biography directly from the AWA for $37.95 (plus a $2.05 shipping and handling charge), which is over seven dollars off the bookstore price of $45.00. A special edition, signed by the authors, is available for $47.95 (plus $2.05 s&h). Not only will you receive this outstanding work at a significant discount, but the AWA will also receive a cash contribution for each volume sold. What's more, for this contribution, you may take a tax deduction of $17.50 (basic book) or $27.50 (special edition).

So what are you waiting for! Send $40.00 for the basic book or $50.00 for the special edition to: Dexter Deeley, Antique Wireless Association, 8 Briar Circle, Rochester, NY 146182.

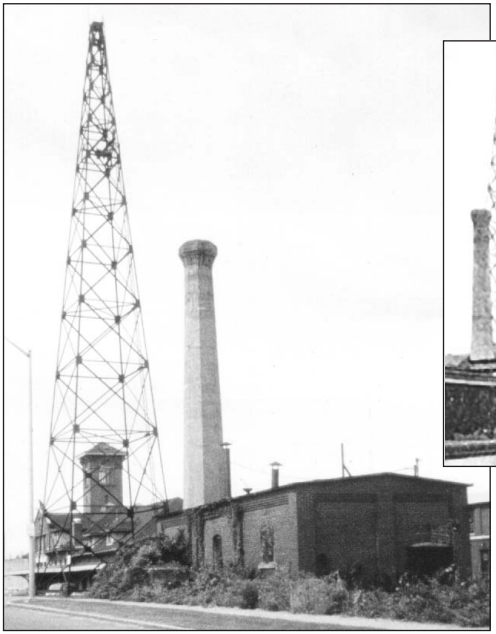
Marconi Tower to get Historical Marker

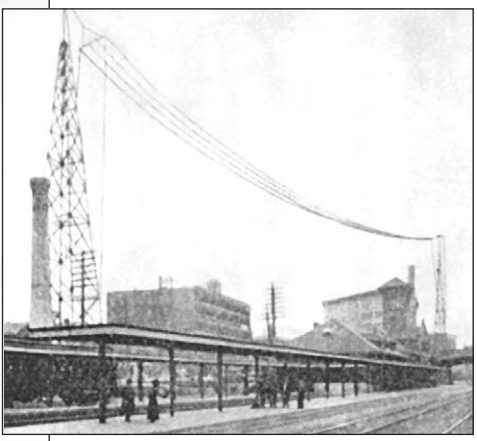
During the summer and fall months of 1913, on a site next to the Lackawanna station in the heart of Binghamton, NY, workmen labored with steel beams brought in by the railroad. Under the supervision of none other than David Sarnoff, a young man who was rising quickly in the Marconi organization, the tower soon reached its final height of over 97 feet.

The tower was one of a pair erected by Marconi at Binghamton as part of a successful experiment to test the feasibility of communicating telegraphically with moving trains. Within the railroad station itself was installed a 2 kW, 500-cycle, multiple-gap spark transmitter manufactured by the Marconi Company. It operated at a wavelength of about 1,600 meters. Four antenna wires ran from this tower to a second one, of about the same height, 425 feet away. Similar equipment, of lower power, was installed in a test train. A twin radio station, similar to the Binghamton installation, was established at Scranton, PA.

In Binghamton, the tower by the station still stands, though its mate was removed in 1925. Two local firms: Scott's Radio and Television Company (a high-tech electronics service center) and For Your Listening Pleasure (vintage radio/phonograph sales/restoration) are sponsoring an initiative aimed at preserving the tower. Several other individuals and historical societies are also involved in the effort.

The tower is in remarkable condition, considering its age and lack of maintenance. Weeds and debris have been removed from the tower area, and a "Marconi Tower Historical Marker" will be dedicated on Friday, October 9th in a public ceremony. The ceremony will be held at the tower site (Station Square-Lewis St.) and begins at 1:00 p.m. For additional information, contact Scott's Radio and Television at 368 Clinton St., Binghamton, NY 13905. Phone: (607) 797-0066; Fax: (607) 797-0013; e-mail: tvrprman@aol.com; Web Site: http://www.everythingradio.com.





Left: The Binghamton tower as it looks today. Old Lackawanna train station in foreground.
Above: The Marconi antenna system as originally installed. Tower in background was demolished in 1925.

BY CARLOS ALBERTO FAZANO

THE BIRTH OF SEMICONDUCTOR ELECTRONICS

In 1948, when the transistor was invented at the Bell Telephone Laboratories, the press treated the news almost indifferently. But the birth of this small semiconducting device was the beginning of a new era for mankind. The purpose of this article is to describe briefly the unfolding of the solid state era, from its beginning up to the development of the integrated circuit in 1965 — with emphasis on the evolution of solid state devices as detectors of radio waves.

The Earliest Detectors

The story really begins around 1887, when the scientist Heinrich Hertz put the whole subject of electromagnetic radiation on a firm basis. In a series of classic experiments, he established that radio waves did exist and that they could be reflected, refracted and also polarized similar to light waves. But since these Hertzian radiations could not be perceived directly by human senses, it was necessary to provide some means for detecting them.

Early detectors utilized various physical principles, including:

(1) The cohesiveness of metal particles in the presence of radio waves, as in the coherer developed by Branley, Munk and Bose.
(2) The influence of magnetic fields, as in the electrodynamic or hysteresis detector. The development of this device is associated with Thompson, Fleming, Fessenden and Marconi.
(3) The heating effect of a current flowing in a wire, as in Fessenden's Barretter.

Crystal Detectors

Of course these early detectors passed into obscurity after the discovery of the properties of crystals and other semiconducting materials.

In 1874, the german physicist Karl Ferdinand Braun discovered that certain minerals such as galena, lead sulphide, had the property of unidirectional conductivity. That is, they would allow the passage of alternating current passing in one direction but inhibit the return surge. His work

English carborundum detector kit and sample of carborundum mineral.

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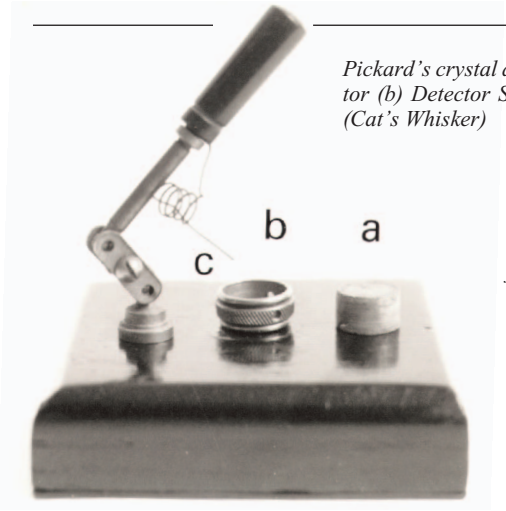


Pickard's crystal detector. (a) Mineral Detector (b) Detector Socket (c) Detector Contact (Cat's Whisker)

established the rectifying properties of the contact of a metal wire on a selected mineral, creating the first metal-semiconducting junction.

In 1902 Greenleaf Whittier Pickard, building on the research work of Prof. Braun, developed the crystal detector for radio waves. Though Pickard's crystal detector had been manufactured since 1906, patent for his invention was granted only in 1908. About that time another experimenter, H.H.C. Dunwoody, began to use the detector in practical circuits. Dunwoody, while working for the U.S. Army, also invented the carborundum radio detector in 1906.

The sensitive and practical crystal detector was a leap forward in the detection of electromagnetic radiation. However, its use began to decline with the development of reliable thermionic devices.

The First Thermionic Devices

The thermionic age began in 1879, with Edison's incandescent lamp experiments. Through studies to improve the quality of the lamp filament, he discovered that a current would flow, in a glowing lamp, from a metal plate inserted in the lamp to the positive filament terminal. This observation became known as the "Edison Effect."

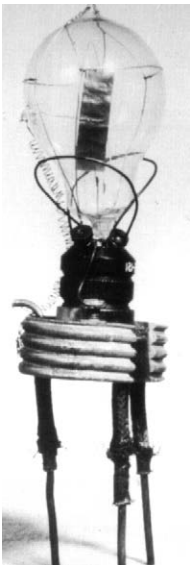
This discovery eventually led to the development of the "Fleming Valve," the first thermionic diode, in 1904. It was a practical rectifying device that was soon put to use as a radio detector. That discovery was followed a few years later (1906) by the three-electrode valve, or *Audion*, invented by Lee DeForest. DeForest's patent (granted 1907) was entitled: *Device for Amplifying Feeble Electric Current*. In this all-important paper, the inventor states that the Audion's output current is controlled by an electrode (the "third" electrode or "grid") that does not draw appreciable current itself.

In spite of the enormous potential of the Audion vacuum tube, its application was not immediate. Initially it was used as a wireless detector rather than an amplifier. This latter capability was first employed a few years later, based on the pioneering research work of such scientists and engineers as Fritz Lowestein, John Stone, and especially Dr. D. Arnold. By the early 1920s the vacuum tube had all but replaced the crystal detector for any serious radio applications.

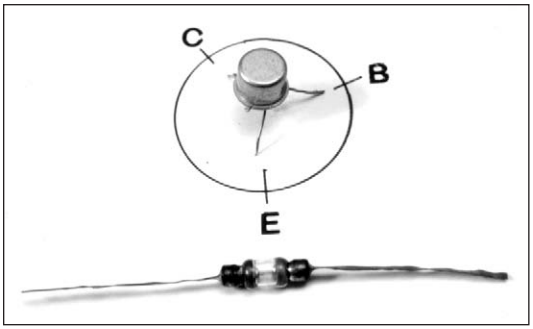
Semiconductor Diodes

By the end of World War II, DeForest's Audion had evolved into a highly sophisticated device. However the engineers at Bell Laboratories, anticipating the mushrooming expansion of world-wide communications, were looking for amplifying and switching technology that (a) would be more reliable and less power hungry than the vacuum tube and (b) substitute for the slow electro-mechanical relays then being used for telephone system switching.

Through researches in the new field of solid state physics, scientists



The Fleming valve: first reliable thermionic device.

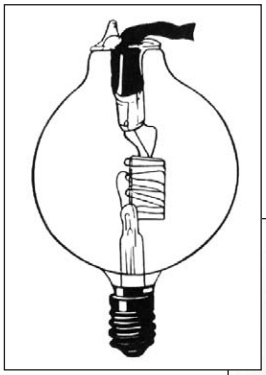


Bipolar transistor with emitter, base and collector leads labeled (top) and early germanium diode.

finally developed a theory for the operation of a semiconductor rectifier. They discovered that certain crystalline materials, like germanium or silicon, though normally nonconductive, can be made to conduct electricity through the addition of small amounts of other substances, a process called doping. In the case of silicon, the substances are phosphorous or boron.

Phosphorous adds free electrons to the crystalline structure. Doping with phosphorous creates what is called "N-type" silicon. Boron adds "holes," or locations that can accept electrons. Doping with boron creates "P-type" silicon.

Electric current is a flow of electrons. In the case of the N-type material, the flow is made possible because every time a new electron is pumped into the material, a free electron leaves the material—making room for another new electron, etc. In the case of the P-type material, the current flow is established in a complementary manner. Instead of electrons, one can think of "holes," or "electron-need" sites, traveling through the material — with the holes accepting an electrons as they are pumped in.



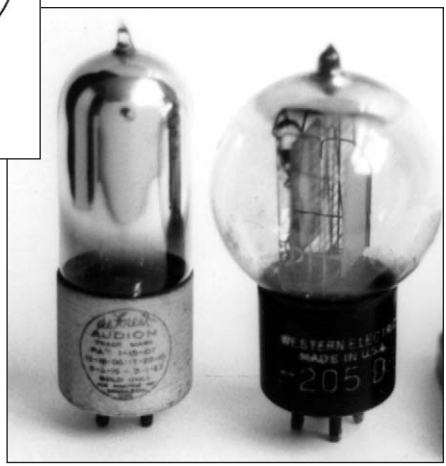
Drawing of the original DeForest Audion.

When an attempt is made to pass current through a piece of P-type material and a piece of N-type material in contact with each other, the current will flow in only one direction across the boundary layer or "P-N junction." When polarity is in the current carrying direction, free electrons in the N material flow to the junction, cross it, and are accepted by "holes" in the P material. But when polarity is reversed, both the free electrons and the "holes" are forced away from the junction and there can be no current flow.

And so this diode, as it is called, acts as a rectifier, conducting only during the half of the a.c. cycle when polarity is favorable. Generally sealed inside a small glass or plastic tube, diodes are used in many electronic applications today.

The Transistor is Born

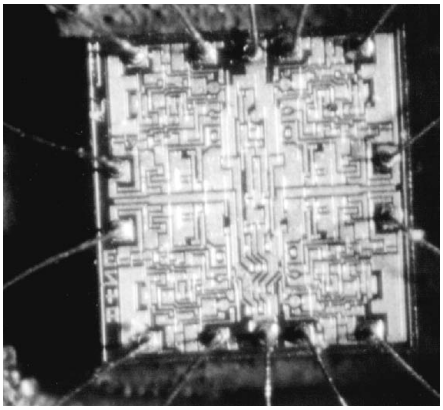
A team of physicists at Bell Labs, William Shockley, John Bardeen and Walter H. Brattain, took this research still further. They developed a device that, in highly simplified terms, consisted of two diodes mounted "back to back." For example, a layer of p-material sandwiched between two layers of n-material or vice versa. Electrodes, or connections, attached to the emitter and collector are fastened to the "outside" pieces, and another connector, to the base, is fastened to the "sandwiched" piece. Now a relatively large current flow between the two "outside" contacts could be controlled by a relatively small current through the "sandwiched" contact, or base. So the base is analogous to the grid



DeForest DV-1 Audion of about 1922 (left) and Western Electric 205-D, which was a re-engineering of original Audion for telephone applications.

of a thermionic triode valve.

This device could be used for switching, as a replacement for the slow mechanical relays, or for amplification of electrical signals. It was christened the transistor, and the configuration described above is known as a bipolar transistor. The first transistors were unreliable and of vari-



Modern integrated circuit showing components and connections.

able quality, but manufacturing techniques were improved until performance and consistency of manufacture equalled or surpassed those of their thermionic predecessors.

New Horizons

By the latter 1950s new semiconductor technologies were available, including the planar transistor, field effect transistor, metal oxide semiconductors and the tunnel diode. These found plenty of applications in biomedical, communication, military and, certainly, the computer fields. However, if the transistor had an enormous impact on the electronic industry, the birth of the integrated circuit in 1965 revolutionized it.

In this new technology a whole array of components such as diodes, resistors, capacitors and so on could be built, assembled and interconnected in just one piece of silicon crystal. Finally, over sixty years after the introduction of the crystal detector, the new technological field of microelectronics was born.

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ACKNOWLEDGEMENT

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BREADBOARDING

EDITED BY **RICHARD A. PARKS**, 2620 LAKE RIDGE CT., OAKTON, VA 22124
PLEASE INCLUDE SASE FOR REPLY.

Bring Historical Circuits to Life On Your Workbench!

Sir Oliver Lodge and the Loose Coupler

I just read in another publication an ad for a "Navy-style loose coupler" for sale at $650.00. We'd better get busy building one for ourselves as an investment!

What makes a loose coupler loose? Why is there a coupler anyway? How loose should it be? In this column we're trying to learn how the science and practice of radio grew toward the efficient circuits of today, by doing thought experiments and breadboarding our own circuits to get a feel for radio history. Our present topic is crucial to the development of radio and it might be rewarding and amusing as well, if we're lucky!

Sir Oliver Lodge (1851-1940) was a thorough experimenter — he discovered the need for and, in 1898, perfected a receiver that could separate simultaneously-received radio signals one from another (1). He called this *tuning*. Without good means of tuning his receiving circuits, an operator in spark days might have to separate one station from another by using the computer in his head — listening for a certain note from a synchronous gap transmitter, or maybe just settling for copying the loudest signal he was picking up. We say that a radio that can separate stations well by carrier frequency is *selective* — how's the separation done?

Here's an experiment: put up the longest and highest long-wire antenna you can manage and connect a pair of 'phones between its lead-in and a good ground (Figure 1A). You may hear a hum, but nothing else. Now connect a diode in series with the phones (Figure 1B). You can hear a faint electronic soup — radio stations and noise sources overlaid. If now you connect a coil of wire between antenna and ground, leaving the diode and 'phones connected, too (Figure 1C), you will hear one or more stations, and louder. Different coils, different stations. Here's what's happening.

Without the diode, the r.f. signals from the antenna pass into the 'phones but are (1) balanced because of the amplitude modulation employed by the radio station, and (2) inaudible because the carrier frequency is too high to hear (Figure 2). Putting the diode (detector) in the circuit rectifies and unbalances the 'phones' current and makes the modulation envelope apparent (Figure 3). So that's what the detector does. We'll come back to that another time. But how come different coils, different stations? Simple — it's done by tuning.

Tuning involves the use of resonant circuits — combinations of coils and capacitors that act to filter out all received signals that don't use the carrier frequency we want.

In any coil, each turn of wire, because it lies next to another, will have some capacitance relative to the next turn, and all of the inter-turn capacitances amount to an invisible fixed capacitor across the coil. That's a tuned circuit — the coil will be "self-resonant" at some frequency. So when we put an inductor between antenna and ground, we set up a "tank" circuit that will resonate at a particular frequency. Different coils, different frequencies, different radio stations. Adding another capacitor across the coil just lowers the resonant frequency and gives us a way to select stations by making the capacitor

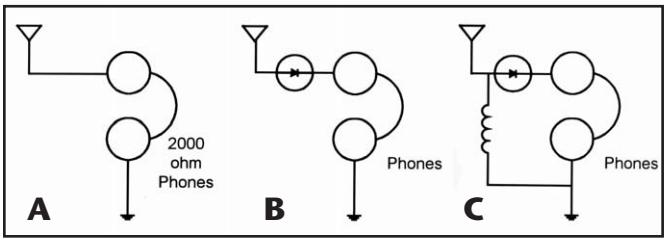


Figure 1.

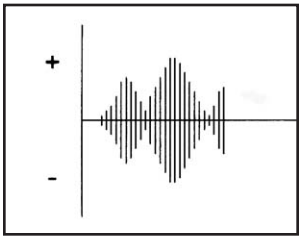


Fig. 2. Modulated rf carrier.

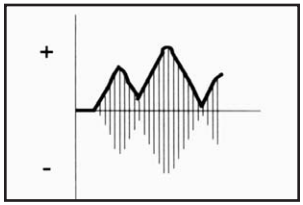


Fig. 3. After detection, modulation envelope is rectified (heavy line).

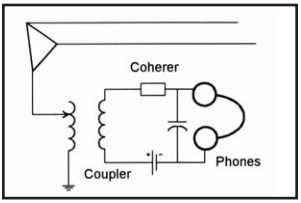


Fig. 4. Lodge's receiving circuit.

variable. But what does all this have to do with couplers?

The job of an antenna coupler is to induce received signal currents into an inductor. Induce — inductor, get it? The target inductor is usually part of a tuned resonant circuit. A loose coupler is one where the antenna has the least possible effect on the resonant circuit while still effectively passing the signal desired. What would be a *tight* coupler? A power transformer.

Lodge invented the loose coupler, in which the detector was removed from the antenna circuit to a secondary tuned circuit, so that "the resistance of the antenna was reduced, thus reducing the local damping of the received electric waves."

Lodge's 1898 receiver, (Figure 4) used a detector called a coherer — we'll just use a good old 1N34, or any "crystal" diode. Since we're not using a coherer, we won't need the battery shown in Figure 4.

In the old days you needed to cover a wide range of wavelengths since ships, the first users of wireless, worked way below the broadcast band and that band extended to about 200 meters (1500 kHz). Our couplers will work only the BC band, so we can simplify the coil designs.

Figure 5 shows a loose coupler similar to that used by Lodge (2). A small-diameter solenoid-wound coil is made to slide in and out of a larger tuning coil on a pair of wire guides. Sliding contacts on the guides connected the inner primary circuit to the antenna and ground, and the outer coil connected to the rest of the receiver. As the primary slides out of the tank coil, the coupling gets looser, and the antenna has less influence on the tuning characteristics of the tank.

Figure 6 shows another way to vary the coupling between an antenna and a tuning tank. Here a movable primary coil rotates 90 degrees inside a fixed secondary tank coil. When the primary is at a right angle to the main coil, coupling is theoretically zero, and it's maximum when the coils are aligned. This arrangement is called a varicoupler.

I built both of these things, but it's up to you which way you want to go. Let's go for quick and dirty:

Did you wind a coil for last issue's column? If not, wind one now: sixty to eighty turns of any kind of wire on a form three or four inches in diameter will do fine. For a base, a sheet of copperclad circuit board is easy to use for rough breadboarding; just solder terminal strips, wires, and small parts right to it. You might use a piece of perf-board from Radio Shack — that's fine. Or swipe an aluminum cake pan from the kitchen and make ground connections with screws. Don't use steel — it's magnetic and will mess up the tuning coil.

We'll make Lodge's receiver right on the

(continued on page 19)

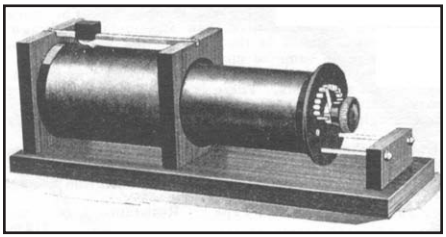


Fig. 5. Loose coupler similar to Lodge's.

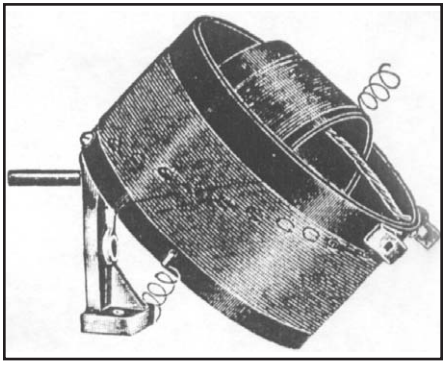
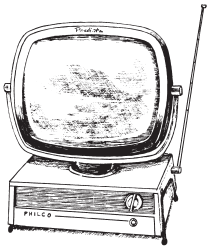


Fig. 6. Variocoupler.



TELEVISION

EDITED BY **RICHARD BREWSTER**, 145 LITTLE PECONIC BAY ROAD,
CUTCHOGUE, NY 11935 *PLEASE INCLUDE SASE FOR REPLY.*

A Pre-War RCA Suitcase Camera Comes to Light

By Eric Stumpf

It's always exciting when a significant artifact from broadcasting's historic past surfaces! Recently just such an item came into my possession: a 1939 RCA iconoscope television camera. It was previously thought by the majority of television historians that no cameras from the Pre-World-War-II period had survived. None exist in museums and, up to now, no collectors have admitted to owning one. How this time capsule came to see the light of day after a half century of obscurity is an interesting story that will be told at a later date.

Those familiar with RCA's pre-war television hardware might not recognize this camera; it is quite different from those then employed in studio televising and was designed with field usage and portability in mind. My unit is serial #001 and is experimental in design and prototypical in construction. It's thought that two cameras of this type were built by RCA for tests conducted by WNBT-New York: RCA's pioneer television enterprise.

Found along with camera #001 were several units from the original camera chain: a synchronizing generator pulse unit, a synchronizing generator shape unit, two power supplies, a Houston-Peerless design RCA friction head and tripod as well as an engineer's hand-drawn schematic of the camera chain's circuitry. Missing are the camera control and camera auxiliary units.

Fortunately, RCA documented the field trials conducted with this gear, which was referred to in period RCA literature as "Transportable Suitcase Type Pickup Equipment." Using them alongside the other, heavier-duty RCA field units, NBC telecast the 1940 Republican National Convention with these compact, portable cameras. Several photographs exist in which a camera identical to mine is being used there in Philadelphia during the week of June 24th, 1940. I have also seen a photo of this camera televising President Franklin Roosevelt, who is seated before a desk in an unidentified location which could possibly have been the 1939/1940 New York World's Fair (just conjecture at this point in my research).

Though production of television sets was suspended during World War II, television broadcasting continued throughout the period. The suitcase-type camera equipment was used for approximately five years. By 1944, RCA engineers were hopeful that their new image-orthicon

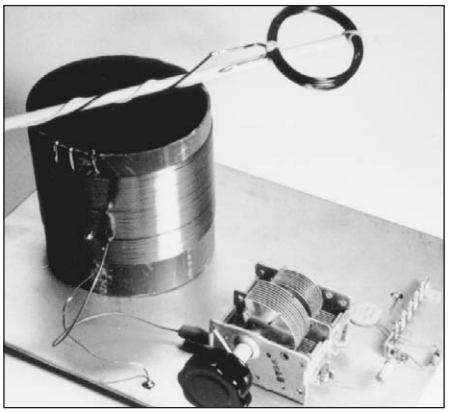
Photo copied from vintage RCA tech manual shows complete "suitcase" system.

pickup tube would provide superior field and studio performance, thus making the small type 1848 iconoscope camera obsolete.

Eventually this "second-rate" equipment was sent from WNBT to the West Coast arm of the NBC television system: KNBC Hollywood. It was not uncommon for RCA/NBC to reassign older hardware to its "outside" operators. Collectors have located RCA TV equipment in places as far away as South America and Israel.

My research efforts on the subject of #001's history continue. A more comprehensive article with contemporary photographs will appear in a future issue of this publication. Any historians, club members or collectors who could provide me with additional information have my thanks in advance. Please contact: Eric Stumpf, P.O. Box 425, Newbury, NH 03255.

***BREADBOARDING**, continued from page 17*



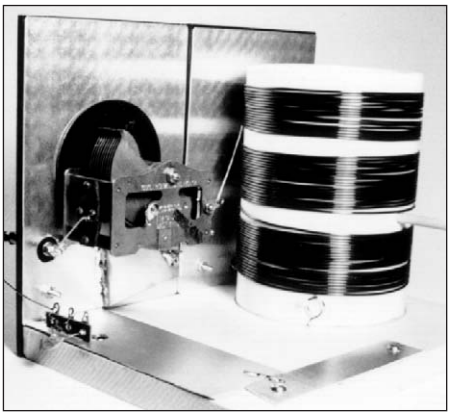


Fig. 7 (left) and Fig. 8 (right): Two versions of my breadboarded Lodge receiver (see text).

ground plane. Our tuner will be a junk tuning capacitor from any old radio. Its frame is ground - one or two screws will do. My kluged breadboard, on an 8"×12" piece of circuit board, is shown as Figure 7. You can see the coil and its taps at 20 and 40 turns. On the right behind the tuning cap is a terminal strip with the 1N34 diode connected between the cap and the "output" terminal. There's a 10 k resistor where the 'phones would go, and a ceramic capacitor to ground, for rf bypassing. On top of the tank coil is a scramble-wound primary coil connected between antenna and ground and strapped to a length of ¼" dowel, so I can move it around the tank from a distance.

When I hooked up this circuit to an amplifier (phono input), I got three local stations with no antenna at all. Using the handheld antenna coil and any external antenna, I had stations everywhere. In fact, they overlapped, especially if the coupling was close. What does your breadboard do? What happens when you move the tuning capacitor connection from one coil tap to the other? My tuning range was from 358 kHz up to 2040 kHz. Do you get about the same?

Loosening the coupling makes the tuning sharper, but it also lowers the output signal. This is Mother Nature at work. Since we have a sensitive amplifier, we can make up for a reduced output, but the old-timers, with only sensitive galvanometers and 'phones, had to put up longer, higher antennas and invent tricky detectors to get every dB they could from those early receivers.

Figure 8 shows another version of the loose coupler. I made this one with a rotating loop inside the tuning coil. Next to the coil is another module with an old Freshman tuning capacitor and the same haywired detector temporarily connected for testing. If this keeps up, I'll have my own Interpanel Receiver.

Next time — how about those tricky detectors?

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BY JAMES P. RYBAK

"FORGOTTEN" PIONEERS OF WIRELESS

Part 4 — Charles D. Herrold

Once again we welcome Jim Ryback back to our pages with another installment of his fascinating and ongoing series on "forgotten" wireless pioneers. Newer readers of the OTB *might like to know that Jim's first three articles in the series (on Nathan Stubblefield, Dr. Mahlon Loomis, and Fr. Joseph Murgas) appeared in the May, August, and November 1997 issues, respectively. —MFE*

Perhaps calling Charles David Herrold "one of the pioneers of radiotelephony technology as well as the person who initiated the first regular and extended series of experimental radiotelephone broadcasts to an audience for entertainment purposes" comes reasonably close to identifying accurately the man and his place in history. Others before him had made important contributions to radiotelephone technology but their experimental broadcasts were neither as regular nor as extended as Herrold's. These earlier broadcasts also were not made to a general audience for entertainment purposes.

Mike Adams' excellent article "The Race for Radiotelephone: 1900-1920", which was published in Volume 10 of *The AWA Review,* describes well the overall work of Charles Herrold together with that of Reginald Fessenden, Valdemar Poulsen, Lee DeForest, Frank Conrad, and other radiotelephone pioneers. The intent of the present article is to focus specifically on Charles Herrold's technical achievements.

Charles Herrold was 31 years old when the 1906 San Francisco earthquake occurred. He and his company had been designing and manufacturing electrical equipment in that city, but the devastating earthquake ended all that.

Herrold then went to Stockton, CA where he taught electricity at a small private school. He had a knack for teaching as well as for designing and inventing electrical equipment. Working for someone else, however, did not provide him with the opportunities and challenges he wanted. Herrold returned to San Jose, CA where he had grown up. There he started "The Herrold College of Engineering and Wireless" in January of 1909 to train wireless operators.

Charles Herrold wanted to provide his students with practical and interesting applications of the knowledge they were gaining in the classroom. He also wanted to advertise his school to the public. Why not, he must have reasoned, combine both goals by entertaining the public with radiotelephone broadcasts? The possibility that he might also achieve personal fame and financial reward by developing radiotelephony into a practical medium for both communication and entertainment likely crossed his mind on more than one occasion.

It must be remembered that in those days only a relatively few "hams" and other wireless experimenters would have had a crystal detector set capable of receiving radiotelephone broadcasts. While Herrold was readying his transmitting equipment, he and his students built 50 crystal sets which were given to people in and around San Jose. In this way, Herrold made possible the broadcast audience he wanted and needed.

Charles Herrold began his experimental broadcasting in 1909, operating from the bank building where his school was located, shortly after the school opened. Neither a government license nor call letters were required at that time. Herrold merely announced "This is the wireless telephone on the Garden City Bank building in San Jose, California" or "This is San Jose calling." Before long, however, Herrold adopted the call letters "FN" for his station.

Those in the area known to have crystal sets were advised of the broadcasts beforehand by

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telephone calls. By 1912, Charles Herrold would be making weekly Wednesday night broadcasts of news, music, and talk.

At first, Herrold modulated a low power spark transmitter, but the signal was noisy and not of very good audio quality. Spark transmitters produced pulses of damped sinusoidal oscillations which, by their very nature, could never be made truly suitable for voice and music transmissions. Herrold knew this as did the others before him who had experimented with radiotelephony. A generator of undamped radiofrequency oscillations was needed.

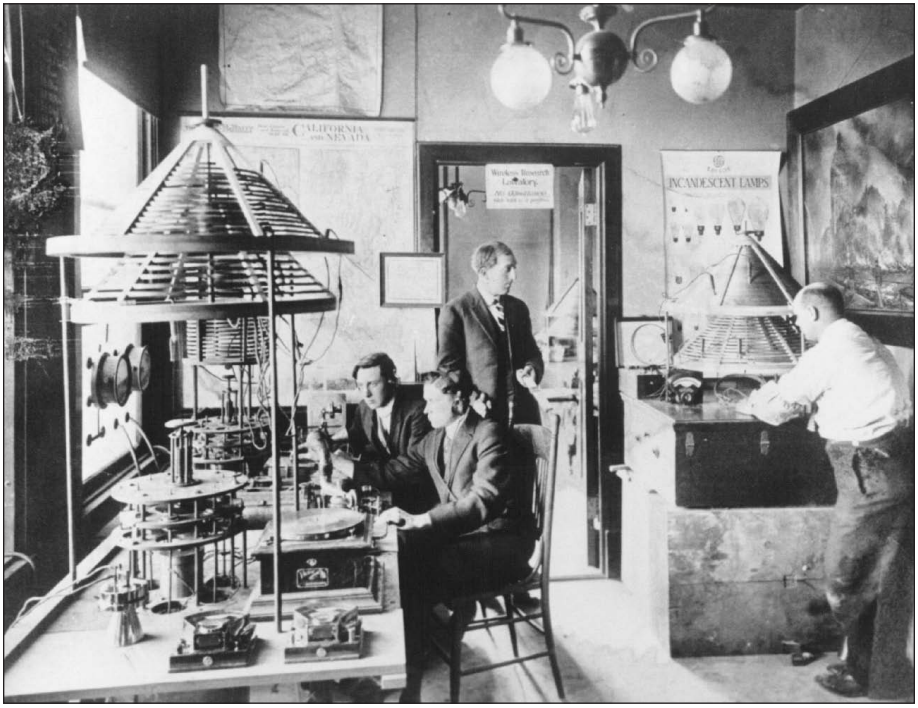
Both alternators and arc discharges could produce undamped oscillations but these devices, too, had some "problems" associated with them. Alternators, still very new in 1909, were physically big as well as complicated and expensive to build. In addition, the existing successful designs were protected by patents.

Arc transmitters could be built at substantially less cost than could alternators. Arc technology, too, was in its developmental stage. In addition to the fact that an arc transmitter would meet his own immediate needs and resources, Herrold saw the opportunity to perfect arc technology for commercial use. The problem (again) was that the existing arc transmitter designs were protected by patents. Herrold decided he would develop an arc transmitter of a new design and on which he could obtain his own patents. With the help of several associates, he began his work.

Existing arc discharges tended to be erratic and difficult to control. A wavering arc produced an unsteady signal. To produce constant frequency continuous waves suitable for radiotelephony modulation, Herrold had to develop an arc discharge which was both steady and controllable.

Charles Herrold applied for a patent on what he called an arc "Oscillator for Wireless Transmission" on April 21, 1913 and was awarded patent number 1,096,717 on May 12 of the following year. His design is shown as Figure 1.

In his patent application, Herrold claimed that the goal of his arc transmitter design was to "im-



The San Jose, CA broadcasting station. Herrold stands by doorway.

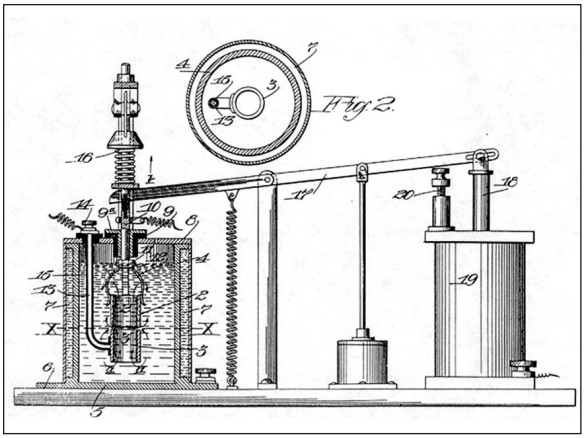


Fig. 1. "Oscillator for Wireless Transmission"

prove the construction of the electrodes, so as to produce a steady, uniform oscillating spark, and which will also allow a perfect circulation of the imperfect cooling liquid, thus producing uniform transmission of high efficiency." The following explanation closely follows that provided by Herrold in his patent application.

The electrodes were two cylindrical tubes, **2** (carbon) and **3** (copper) (bold numbers and letters refer to characters on the drawing), with their ends opposed to each other and parallel. The arc discharge took place between these end surfaces. Herrold did not want the arc to be able to shift between the inner and outer edges of the tubes as this change in arc length would produce a variation in the oscillations. Consequently, the walls of the tubular electrodes were very thin. The intent was to force the arc to move in a smooth, uniform path around the circumferences of the electrodes. This resulted in even burning of the carbon electrode.

Unlike most other arc discharges, Herrold's design did not employ conventional water cooling of the electrodes. Rather, an "imperfectly conducting liquid" constantly passed through the center portion of the electrodes by convection in the direction shown by the arrows, **a**. The moving liquid, in turn, was cooled by the water circulating in the jacket, **7**. This cooling technique was essential to having the arc move smoothly around the circumferences of the electrodes. The spacing between the cylinder end surfaces, and hence the arc length, was controlled by a mechanism consisting of elements **16**, **17**, and **18** which were activated by the solenoid magnet, **19**.

An arc discharge had to be extinguished for a time during each r.f. cycle if it were to act as a true oscillator. On high power discharges, it was common to extinguish the arc by using a blast of air and/or a strong magnetic field. The successful implementation of these techniques developed by others were protected by patents. The same result, however, could be achieved in low power arcs by placing a capacitor in parallel with the discharge. This is the technique used by Herrold.

Operating several separate arcs in series increased the output of the oscillator. The ability to adjust the electrode spacing of each arc independently was needed to produce synchronized oscillations. Otherwise, irregular, damped oscillations would result.

Several weeks after filing his first patent application, Herrold filed another for a "Magnetic Lift for Electrodes in Electric Oscillators." In this patent application, he described "an electric, automatic mechanism for the purpose of simultaneously lifting a plurality of electrodes in an oscillating circuit, and also for the purpose of adjusting the spacing between the electrodes where several electric oscillators are installed in a circuit."

Herrold was awarded patent number 1,120,306 on December 8, 1914 for this mechanism which could control the electrodes of two arcs in series. The mechanism is shown as Figure 2. Several years later, Herrold was awarded patent number 1,222,761 for an "Oscillator" in

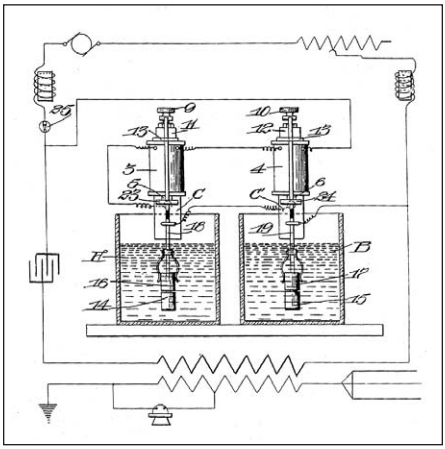


Fig. 2. "Magnetic Lift for Electrodes in Wireless Oscillators"

which four arcs, each connected in series and each with independently adjustable electrode spacing, were controlled by a single solenoid. This arrangement is shown as Figure 3.

Herrold fully realized that a "loose coupling" circuit was needed for transferring energy from his arc transmitter to the antenna. He knew that having the coupling too "tight" would result in a double peaked resonance curve with neither peak occurring at the natural resonant frequency of the coupling circuit's primary and secondary sides. This would make it impossible to produce continuous waves of a single frequency. Herrold also knew that Marconi, Braun, Stone, and possibly others already had patents on loose coupling circuits and that he would have to design a form of loose coupling on which he could get his own patent.

The "conical helix" which Herrold designed in 1913 to provide loose coupling, and on which he received patent number 1,145,366 in 1915, is shown as Figure 4. Herrold's patent application states that the object of the circuit was "to provide a simple, efficient, easily adjusted, inductive coupling of a conical shape, having separate primary and secondary windings adjustable with relation to each other, which are so positioned that the winding surfaces will at all times be parallel, and which may be given the greatest range of coupling, and which the loosest coupling may be accomplished with the maximum transfer of energy."

Charles Herrold further claimed in his patent application that the conical design resulted in a minimum of "electrostatic self-induction" in the windings. In addition, Herrold maintained that his design "provided means for cutting out the dead ends of the windings after the coupler had been adjusted, thus preventing any needless radiation and waste of energy in the inductive ends of the primary and secondary windings."

The accompanying photograph shows Herrold in the doorway of his San Jose station with two conical helix couplers clearly visible. Despite the improvements Herrold claimed for his transmitter and coupler, it is questionable (see Source 2) whether his patents could have successfully withstood infringement charges had he tried to market these devices.

Herrold also needed to solve another problem associated with the existing arc transmitter technology. The full arc current passed through the microphone when the signal was modulated. As a result, the microphone would overheat and thereby limit the broadcast's duration. Herrold and his assistant E. A. B. Portal designed in 1913 and patented in 1915 (patent number 1,165,255) a water-cooled multiple-element microphone which they called their "telephone transmitter." This microphone is shown as Figure 5.

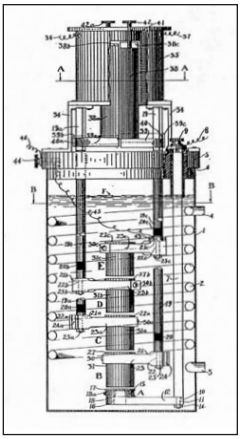


Fig. 3. Oscillator incorporating four independently adjustable arcs.

Six separate carbon microphone buttons were connected in series under a single diaphragm. Water circulated in the cylindrical chambers around each element to provide the necessary cooling. With this microphone design, Herrold eliminated the overheating problem and could broadcast for long periods.

At the 1915 Panama-Pacific Exhibition in San Francisco, Lee DeForest planned to demonstrate his audion amplifier. He had licensed the audion to the American Telephone and Telegraph Company for long distance telephone service. A.T.&T. had perfected the use of the audion as an amplifier and had established coast-to-coast telephone service in time for the Exhibition.

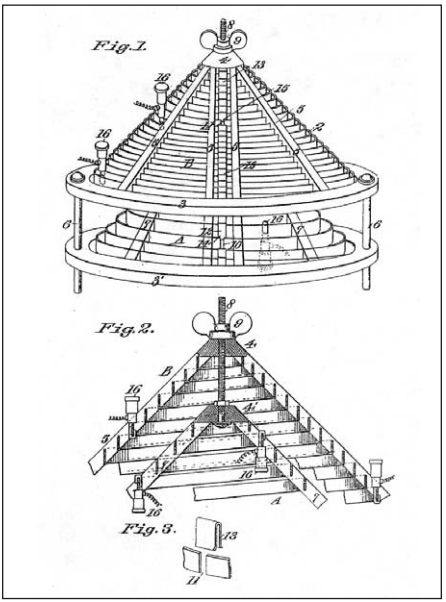


Fig. 4. The "conical helix" loose coupler.

When DeForest's transmitter failed to operate, it was suggested that Herrold transmit six to eight hour daily broadcasts of music from San Jose so that the signal could be received at the Exhibition and amplified by DeForest as a demonstration for the attendees. This was accomplished with great success. As a result of these daily broadcasts, DeForest stated in 1940 that Herrold's station "can rightfully claim to be the oldest broadcasting station of the entire world…" (see Source 5).

When the U.S. Government established the Radio Act of 1912, licenses and call letters were required for all "voice" transmitters. Herrold's station then was assigned the call letters "SJN." All broadcasting was suspended by the Government during World War I but when broadcast licensing was established following that war, Herrold's station became "KQW." A new owner took over Charles Herrold's broadcasting station in 1925. CBS bought the station in 1949, obtained the call letters "KCBS," and moved the station to San Francisco where it still operates today. KCBS takes pride in being able to trace its ancestry back to Herrold's original 1909 broadcasts.

Author's Note: Mike Adams wrote and narrated a video documentary on Charles Herrold entitled "Broadcasting's Forgotten Father — The Charles Herrold Story." The program was funded by the Perham Foundation Electronics Museum and San Jose State University, and was produced in association with PBS station KTEH in San Jose. It was broadcast in 1994 by PBS stations nationwide. The video may be purchased from The Electronics Museum of the Perham Foundation, 101 First Street, Suite 394, Los Altos, CA 94022 and from several suppliers of books on antique radio.

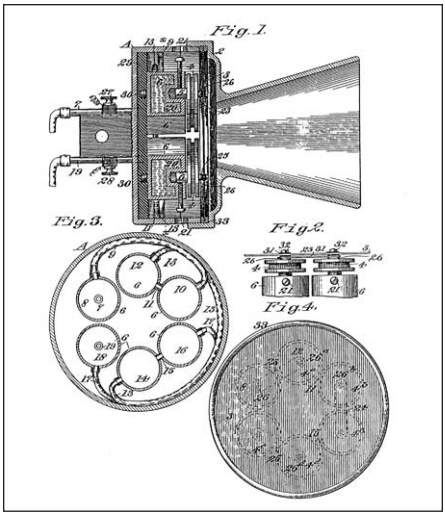


Fig. 5. Water-cooled multi-element microphone.

The author would like to thank Professors Gordon Greb and Mike Adams of San Jose State University for several helpful discussions while preparing this manuscript. Both are recognized authorities on the life and work of Charles D. Herrold.

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BY DICK PARKS

THE WECO MODEL 25 AMPLIFIERS

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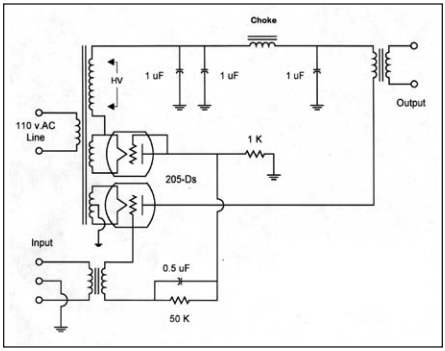
When folks gathered 'round the old Grebe, RA-DA, or AK breadboard, they were likely to be wearing headphones — sometimes two or more pairs, all connected to the set's output jack or binding posts through adapters of some kind. Even without the occasional 90 volt sting from the hot leads, it probably made for uncomfortable listening.

If you wanted to really fill a whole room or hall with the receiver output, it was even more difficult. What could you do if a horn speaker just couldn't do the job by itself? Why, you went out and bought a booster amplifier.

Such units are mighty rare now, but in the last years three of them — all Western Electric Model 25s — have crossed my bench for checkout. The WECO 25 was designed to raise the power level of a home receiver from the usual fraction of a watt to maybe a couple of watts. It used a 205-D triode in a single-ended circuit as shown in the accompanying schematic.

What? You see two triodes? Well, the one with its plate and grid connected together is just a rectifier. It takes a while for this circuit to "sink in," but you'll see that, indeed, one of the tubes is a half-wave rectifier connected in the ground leg of the HV supply. There is a 1000 ohm resistor across which the grid bias appears, and fairly light filtering is done in the high side of the B+ supply by a choke and three paper capacitors.



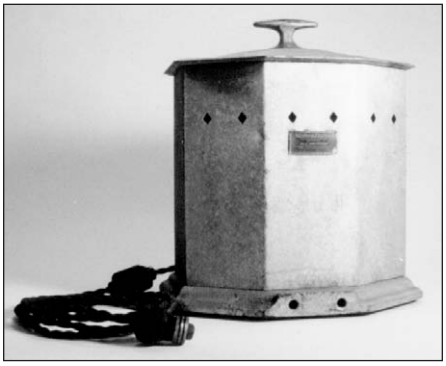
Model 25 circuit is quite simple; there are probably more components in the power supply than in the amplifier itself.

That's all there is. Transformer coupling in and out, of course, and you have to match your speaker to a high output impedance.

As shown in the photos of the Model 25's interior, the two tennis-ball 205-Ds occupy a shelf in the center of the unit. Those triodes go for well over $200.00 apiece these days, and this particular amplifier is bound for Japan at a price well into four figures. It's a completely original and untouched example — even has its original line cord and Edison lamp adapter for connecting to your closest ceiling lamp fixture.

When I powered this unit up (slowly, with a Variac), the B+ bus topped out at 330 volts, and the grid bias was -25 volts. Thus plate dissipation was only 8.25 watts, well below the rated 14 watts for this tube (1). At that operating point, the better of the two tubes could deliver 1.28

(continued on page 28)



The WECO Model 25 in its unusual cabinet. Note light socket power adapter.

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THE VACUUM TUBE

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George M. Rose — A Man Ahead Of His Time

The name of George Rose has appeared in this column many times as the originator of one or another tube family. His many vital contributions to vacuum tube technology profoundly changed the course of vacuum tube history. Before his many achievements are lost to posterity, it is only fitting that they be properly documented.

I had the pleasure of knowing George for a number of years before he passed on and had many conversations with him. George graduated from the University of North Carolina in 1928, with a BS Degree in Electrical Engineering, and was awarded a Teaching Fellowship in the Electrical Engineering Department. At the end of the following school year he was invited to join the Vacuum Tube Engineering Department at the General Electric Plant in Schenectady, New York, under G.C. White, J.C. Warner and B.J. Thompson.

George M. Rose

In the following year, 1930, all General Electric work on receiving tubes was transferred to the newly formed RCA Radiotron Manufacturing Company at Harrison, New Jersey. At this time G.E. turned over the Harrison Plant to RCA. In 1931, J.C. Warner was made Manager of Vacuum Tube Engineering and B.J. Thompson became Manager of Vacuum Tube Research.

At the time of the transfer, George was asked to remain at Schenectady to complete development work on the FP-54, a low-grid-current electrometer tube (Star Tube), for use in stellar photometry. When this project was completed in late 1931, he joined B.J. Thompson's group at Harrison.

As his first assignment, he was asked to develop a functional high frequency vacuum tube. He knew that to produce a workable HF tube he would have to drastically reduce the size of the tube elements and make the lead wires as short as possible. He designed several micro tubes but found that the glassblowers at RCA could not work on such a small scale.

Undaunted, George set about learning the art of glassblowing and in short order had completed his first micro tubes. The shells of two small G.E. light bulbs were later substituted for the handblown glass shells. The rims of these shells were sealed together, with the lead wires extending radially through the seal. Soft lead wires were used during the development stage but these were later replaced by hard lead wires.

By the summer of 1933, sufficient progress had been made on the development of these tubes so that George and B.J. Thompson were able to demonstrate them at the IRE Convention in Chicago. These demonstration tubes were pictured on the front cover of the August, 1933, *Electronics* magazine. After some additional refinements, this family of tubes was christened the 'Acorn Tube Family.' The first tubes were released in 1934.

Upon completion of the development work on the 'Acorn Tube,' George was asked to join the Receiving Tube Advanced Development Group. There he was personally responsible for developing numerous techniques. The first of these was the glass button stem (disc seal) in which the lead wires were sealed at right angles to a small glass disc which served as the tube header. This enabled the lead wires to be made considerably shorter. The disc seal soon replaced the old style press seal where the lead wires were sealed parallel to the glass press. Shortly after this, George introduced hard wire pins. Joining the disc seal and the hard wire pins enabled the combination to serve as an all-glass tube base. This opened the way for the all-glass miniature tube family and the many other all glass tube families that were to follow. These

two innovations soon became industry standards.

In 1933 George developed the cylindrical wire mesh grid. This was patented in 1934 but was not used until the late 40s on the Pencil tube and in the late 50s on the Nuvistor tube. In these tubes it was used as a cantilevered grid and was capable of withstanding 10,000 G's.

George introduced the metal tube glass button stem in 1936 to replace the old eyelet seal originally used. This saved the metal tube during the Great Depression years by cutting the header cost from 7½ cents to 2½ cents per unit. This change also helped to reduce the shrinkage (defective tubes) considerably. He next developed the first metal shell kinescope. These techniques contributed directly to the successful development of the metal tube, the all glass miniature tube, the metal Proximity fuse tube and the metal kinescope. George was also responsible for the development of the straight line exhaust machine on which virtually all kinescopes are still being processed worldwide.

In 1936, in order to produce tubes with more consistent characteristics, George designed a metal tube with ceramic spacers between the elements to hold the spacing uniform. The tubes worked well. When asked why RCA did not follow up on these tubes he replied that, at the time, it was too expensive and would have priced the metal tube out of existence. The ceramic spaced tubes did gain popularity after the war when several companies issued planar type tubes with ceramic spacers. The only difference was that the later ceramic spacers were made part of the tube shell.

In 1940, George became Manager of the Receiving Tube Advanced Development Group. While in this capacity he was both administratively and technically responsible for such developments as:

- The Pencil tube
- 1680 MC Radiosonde tube and cavity combinations
- S-band tube and cavity combinations
- RCA's point-contact transistor
- Electro-mechanical transducer tube
- Ceramic Reed Switch
- Nuvistor tube

If I may digress for a moment, I would like to recount a few of George's recollections. In late 1934 or early 1935 he made a special Acorn tube with a disc seal and hard wire pins. In 1939, when the first glass miniature tubes were released, he found that the engineers had adopted the same pin size, pin spacing, pin-ring diameter and the indexing system that he used on his special Acorn tube. This tube fitted directly into the newly developed miniature tube socket. His special Acorn tube was the first of the glass miniature tubes.

After the "Consent Degree" of November, 1932, G.E. was permitted to get back into the receiving tube business. By early 1933, rumors reached RCA that G.E. was planning to introduce a family of all-metal tubes to mark their return. George was asked to produce a tube that would compete with the all-metal receiving tube. The result was a small tube with a rounded top, tubular glass shell and a glass button stem header. This was covered with a close-fitting metal shield and called the bullet tube.

Terry Schrader, of George's staff, designed a six-prong bakelite base with a special orienting key. This base was later expanded to eight prongs and became the standard octal base used on all the metal tubes. When finished, George was told by E.W. Ritter that he was satisfied that this was the answer to G.E.'s metal tube and that it would be used if necessary. This tube was never released because RCA took over the production of the all-metal tube. However, the bullet tube was the first of the metal/glass tubes. Ironically, the metal/glass tube was used by a number of smaller tube manufacturing companies to compete with the all-metal receiving tube.

Just after the war, RCA wanted to drop production of the Lighthouse tubes because they had a large number of seals and the shrinkage was very high. The military indicated that they had too much equipment that depended on the Lighthouse tubes and would not like to see their production stopped.

To get around this problem George decided to develop a new HF tube family designed around a special diode that he made for the military near the end of the war. The result was the Pencil tube family that was released in 1949. When released, George took a Pencil tube and mounted it in a standard octal socket. He substituted this in a circuit designed for a Lighthouse tube. The new tube functioned excellently. This sounded the death-knell for the Lighthouse tube.

Several months after Western Electric announced the birth of the point-contact transistor, they hosted a public meeting for representatives from the various vacuum tube manufacturing companies. During this meeting George asked where Western Electric obtained the germanium used in the transistor. He was informed that it was taken from a W.E. 400A germanium diode. George left the meeting feeling confident that he could duplicate this feat. Within six weeks of this meeting he had produced RCA's first point-

contact transistor.

George remained Manager of the Receiving Tube Advanced Development Group until 1960 when he was asked to become the Engineering Coordinator for the SNAP 10A Thermoelectric Power Supply being developed jointly by RCA and Atomics International for use in the Space Program. Upon the successful completion of the SNAP 10A Program, he was made Manager of the Thermoelectric Device Development Group, the position he held (except for a one year assignment in the Microwave Department) until his retirement in 1969.

George was a man of great talent, energy, determination and confidence. He never blindly accepted the opinion of the experts. In fact the sure way to bring out the best in him was to have the so called "experts" tell him that "it could not be done." He thrived on challenge. This happened many times during his career as with the acorn tubes, the glass button stem, the hard wire pins, the metal shell kinescope, etc., etc. It was his determination and confidence that accounted for his great success.

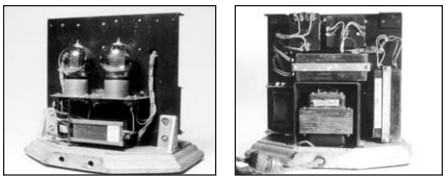
George lived in Mountain Lakes, New Jersey, and was a licensed Amateur Radio operator for much of his life. He received his first call in 1923 — 4JS (then U4JS and later W4JS). When he moved to Schenectady in 1929, he became W2BWX. He allowed his license to lapse during the 1930s but was re-licensed in 1948 as K2AH.

In December of 1952 George again made history by achieving the first known Amateur Radio communication (with W2UK) using a single transistor. He and his transmitter were pictured on the front cover of the February, 1953, issue of *QST*. His story of this event was written up in the March, 1953, issue of *QST* under the title: "The Transistor, or 25 Miles on a Hunk of Germanium". *(For pictures and more information about George's transistor transmitter, see the "Museum News" column of the May, 1998* OTB *—ED)*

George was a member of the AWA. His original patents, his famous transistor transmitter and his modest collection of antique and historical radio receivers are now at the AWA Museum. The most notable of his receivers, the "Lutz receiver", and his transistor transmitter are on permanent display at the Museum. He was also responsible for convincing Otto Shade to donate RCA's first portable TV Transmitter to the AWA Museum.

Every vacuum tube manufacturing company probably had at least one and, no doubt, several George Rose types on their staffs. For the most part their many contributions to vacuum tube technology have been lost to history. We are most grateful to George for having the foresight to preserve the first samples of most of the major projects he was responsible for developing over his long and fruitful career. We are especially privileged that he consented to make these priceless historical souvenirs a permanent part of the Manhattan College Vacuum Tube Museum, located in the Riverdale section of the Bronx, N.Y.C. These relics are mounted in three display panels and contain original samples of all of the tubes and developments mentioned in this article. Fortunately, George was able to visit the museum before he became a silent key in 1984.

***THE WECO**, continued from page 25*



The amp's components are mounted on both sides of a vertical central panel. 205-D "tennis ball" tubes (on shelf, left) now sell for over $200.00 a copy.

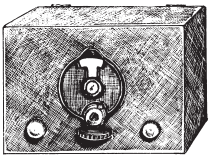
watts into an optimum resistive load of 5000 ohms. It took over ten volts of audio drive to achieve that output level—easily done from an '01A output stage in any three-dialer receiver. Further checks determined that leakage current in the power supply was below 3 milliamps at 350 volts. After over 70 years, this amplifier was working with no problem at all. Put your Mitsubishi away for 70 years and see how well it'll start!

The main difference between Models 25-A (pictured) and 25-B seems to lie in the power transformer. Judging by my dc resistance measurements, the 25-B uses heavier gauge wire in its primary and HV windings. Also, the 25-A is wired with solid wire, while the later model uses stranded wire.

Acknowledgement: The author wishes to thank Mr. Cheong Ong for providing the WECO units described in this article.

REFERENCES:

1. Sibley, Ludwell, *Tube Lore*, 1996, p. 156



AMATEUR RADIO

EDITED BY **JOHN F. ROLLINS, W1FPZ**, HC 33, BOX 150, ARROWSIC, MAINE 04530
PLEASE INCLUDE SASE FOR REPLY.

Bruce Kelley Memorial 1929 QSO Party for November 1998

In November we shall be coming up for the annual 1929 QSO Party. Full details will appear in the November *OTB*, but we want to get out a preliminary notice to alert the participants of the dates and a significant change that we shall try this year. This change will be to move the frequency area to 3560 to 3580 kHz. This move is being made in hopes that we can avoid the RTTY QRM that covers the 3585 to 3620 kHz segment. In the last couple of years this RTTY activity has wiped us out.

Dates for the '29 QSO Party will be **November 28-29** and again **December 5-6**, 6 p.m. Saturday to 6 p.m. Sunday, both weekends. Log sheets and information will be sent out to all of last year's '29 participants. Others can obtain a log sheet by writing to me.

Now on to the 1998 OT DX contest results, as compiled by Randy Haus. After that, we'll close the column with Bob Raide's *An Inexpensive Way to Build a 1929 Transmitter*. Those who have been complaining about the expense of acquiring the traditional type 10 or type 45 tubes now have no excuse for not getting into the contests!—*JFR*

1998 O.T.DX Contest Results

By Randy Haus, KB2PLW

A total of twenty-three stations participated in the April OT DX contest. Less-than-favorable band conditions and a lot of RTTY stations combined to give us all a run for our money. Scores were lower than usual, but judging from the letters that I received with the logs, participants had great fun. Many of you wrote in with very good suggestions for next year's OT DX contest. Several operators would like to have contest times given in UTC to avoid confusion. Great idea — we will use that next year. Paul (W3VVS) suggests that we use the harmonically-related frequencies of 7.025-7.050 MHz and 14.050-14.100 MHz. Old-time rigs can double from 40 to 20 meters and we would have room to move around and escape the RTTY ORM. Please let me know what you think at the conference in September.

Congratulations to Bob Raide, W2ZM, who was the high scorer with 108 points. Bob is known for his distinctive, high-quality old-time signals and sturdy, stable homebuilt gear. Here is a breakdown of the scores:

EAST ZONE

STATION	POINTS	TX	RX
W1YG	72	'38 6V6	'38 HQ120
W1YJ	4	Mod	Mod
W1DX	6	Mod	Mod
W1KSK	63	'37 6L6	'37 HRO
W1DDW	6	'38 6L6	Mod
W2LID	26	Mod	Mod
W2ZM	108	'29 TPTG	'38 HQ120
KE2O	6	Mod	Mod
K2LP	18	Mod	Mod
KX2H	4	Mod	Mod
K2KK	8	'37 6V6/6F6	Mod
KB2PLW	27	'38 6L6	Mod
KD3OR	36	'38 6L6	'39 Hallicrafters S20R
W3VVS	4	Mod	Mod
AA4RM	71	'41 Stancor	'36 RME 69
W9ET	8	Mod	Mod
N9TT	8	Mod	'37 BC312
KC9GQ	6	'30 Hartley	Mod
VE3BHW	3	Mod	Mod

WEST ZONE

STATION	POINTS	TX	RX
K5RB	42	Mod	Mod
W6TDP	42	'37 6L6/80	'39 Hallicrafters S20R
W6DJX	18	'38 HFM	'34 National HRO
W7LOG	9	'38 6V6/807	'38 HQ120

DX ZONE

JH8SST/7 heard by KC9CQ but contact not established.

An Inexpensive Way to Build a 1929 Transmitter

By Bob Raide, W2ZM

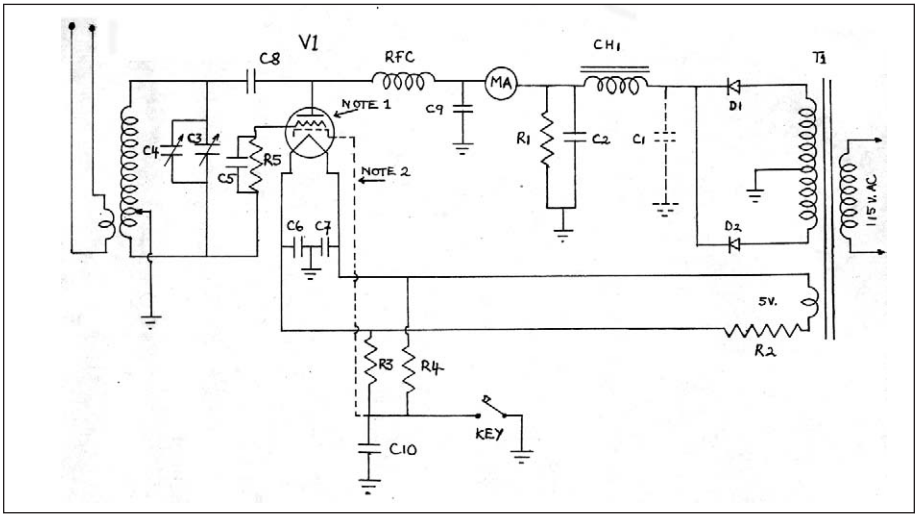
Back in the late 1960s, Bruce Kelley initiated the 1929 QSO Party especially for the old timers of the AWA. These members would revisit their early days of amateur radio. They constructed low-power, self-excited transmitters such as the one Bruce Kelley first built in 1929 — a single 201A in a Hartley circuit. Bruce would then schedule a Saturday night in late fall for 80 meter operation. They would exchange signal reports and equipment information while renewing old friendships. It was an annual affair. With "new" old timers entering the picture it has grown ever since, and is now expanded to two weekends!

This event has not been without its shortcomings, however. The cost and availability of certain tubes and components considered essential have put them out of many people's reach. For example the types 45 and 10, once somewhat commonplace and with a ten- to twenty-dollar price tag, are now selling for well over forty dollars each (if you can even find one for sale)! Components such as beehive insulators and mica condensers of early vintage are not only hard to find, but the latter often prove to be leaky and unsuitable for use.

But there is no need to be intimidated. The simple rules of this event stipulate only the use of a self-excited circuit or MOPA and a tube type of 1929 or earlier vintage having a plate input power of less than ten watts. There are many more common tubes and parts that will fill the bill. The types 24, 26, and 27 are all good choices. The type 24 you say? Yes, it's a tetrode, but it can be connected as a triode and function every bit as well as a 27 or 26. Simply connect the screen grid directly to the plate and you now have a low-mu triode. The cap at top is the control grid, not the plate. Furthermore the types 12A, 71A, and 01A are all good choices and were used by many early amateurs for construction of receivers and transmitters (1). The types 24 and 27 tubes are "UY" (five pin) based while the others are "UX" or "UV" types (four pin).

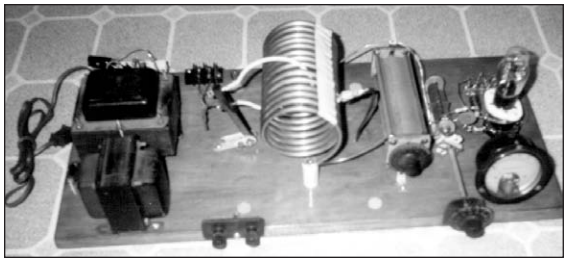
The set illustrated here is nothing fancy. I built it in a couple of evenings on a scrap pine board with junk box parts and some new components purchased at an electronics computer store. The local hardware store provided twelve feet of quarter-inch copper tubing for the tank coil, tank coil plastic standoffs (ask for plastic bushings), and some assorted wood screws. The power transformer and filter choke were scavenged from an old TV carcass found curbside. This combination of choke and transformer have a more than sufficient current capability, which is essential for the good voltage regulation that results in a chirpless note.

As you can see in the photo, everything was mounted on the same baseboard. The five-volt filament winding was used for the various tubes, with dropping resistors configured as necessary for those having other than a five volt filament. Radio Shack has one-ohm resistors that can be



Schematic of generic "Inexpensive 1929 Transmitter" utilizing Hartley oscillator. See text for tube and component options. Antenna terminals at upper left.

series/paralleled to provide the correct voltage for the tube(s) you use. If you haven't got a tube in your junk box, Antique Electronics Supply (6221 South Maple Ave, Tempe, AZ 85283) lists the type 27 shouldered version, good-used, at three bucks each. Buy two, parallel the elements, put the filaments in series and connect them directly across the five volt winding. You can run upwards of twenty watts input with this combo!



The "Inexpensive 1929 Transmitter" as constructed with a type 27 tube.

The Hartley circuit was chosen for its simplicity and great performance as learned from past experience (2). In addition to the version discussed here, I've constructed one with a small PA stage that is on "stilts" and resides above the tank coil, making the set a MOPA. It uses a type 24 mounted on its side with a short lead connecting its control grid to the oscillator tank coil for excitation. This PA stage when, operated as a doubler, makes for very stable 40 meter operation very suitable for QRP work and as an "OT" contest transmitter. It might be worthy of a short article in the future.

A swinging link is used to couple the oscillator output into approximately a 50-ohm load. A single turn of insulated copper wire stuck into the tank coil is all that is needed. Be sure to use heavy wire or copper strap to connect the tank components together [condenser to tank coil]. Even at low power levels there are high circulating currents present. A strip of masking tape across the tank coil dampens vibrations that would otherwise modulate the note.

With a choke input filter, the transformer shown provided about 300 volts DC. With the various tubes mentioned in the text, a plate current of 30 mils was easily achieved, providing nine watts input.

I have made countless contacts using this set with the various tubes mentioned. Its simplicity and effectiveness never cease to amaze me.

Parts List

T1	Color TV power transformer or equivalent, 200 mA @ 300-350 V. each side of center tap.
CH1	5-10 Hy filter choke, low resistance, 150 mA. rating or better.
D1, D2	1 kV or better PIV @ 2 amp silicon diode.
C1, C2	20 mFd @ 450 V DC. Use C1 if 25-30% more voltage is required.
C3	350 pF receiving type variable or parallel two 200 pF units.
C4	50-75 pF small variable for "zeroing to desired freqency."
C5	250-500 Pf ceramic 200 V. minimum.
C6, C7, C8, C9	.002mFd @600V disc or ceramic
C10	.5-1 mFd for shaping keying waveform.
R1	Bleeder 20-25 watt 15k.
R2	Optional filament dropping resistor. For type 27 or 24 tube, series/parallel 1-ohm resistors (see text) to obtain 1.5 ohms. For type 26, 3.4 ohm at four watts is required.
R3, R4	C.T. resistors — 15-20 ohm each (both same value) 1 or 2 watts.
R5	Grid leak, 10k 2-watt for all but 71A or 45 tubes; they require 30-50K.
RFC	2.5 mHy 100 ma choke or wind about 100 turns #30 enameled on ½" dowel.

Tank inductor is 3" in diameter and formed of ¼" copper tubing. Use 12 turns for 80 meters; 22 turns for 160 meters. On a calm day, I have used 7 turns on 40 meters. Works FB!

Note 1: If type 24 tube is used, connect screen directly to plate.
Note 2: For 24 and 27 tubes, which have a cathode.
Note 3: If tube "takes off" (parasitic oscillation), connect a four- or five-turn, half-inch diameter coil at grid pin.

REFERENCES:

(1) All early *ARRL Handbooks* [1926-1935] "Practical oscillator/transmitters-low power sending sets".
(2) *OTB* June 1985, pages 34 and 35 - "A 1929 QSO Party Transmitter" by Bob Dennison W2HBE.

BY M.L. "HUTCH" FREDERICK, WW2A

MAY LILLIAN SMITH
A PIONEER AMATEUR OPERATOR

It all started during a lull in last year's Rochester conference, when I decided to spend some time doing some needed research at the AWA Museum library. In the process, I came upon a scrapbook put together by a long-ago amateur radio operator: Louis Higgins, 1WT, of Manchester New Hampshire. In it, Louis had preserved a newspaper article about another Manchester amateur: May L. Smith, 1DBE. Included was a large picture showing May in her amazingly well-equipped shack. My friend Bart Lee of the California Historical Radio Society was visiting at the museum that night, and I showed him the item.

A few minutes later, returning to my research, I was flipping through the pages of the August, 1920 Radio News. *Looking over my shoulder, Bart stopped me with a "Wait a minute — isn't that the same picture?" It certainly was, and we spent some time studying the photo of the equipment-crammed room and wishing we knew a little bit more about the enigmatic YL sitting in the room full of radios.*

Just at that moment, "Hutch" Frederick, WW2A, happened to enter the room. She is the wife of AWA director Jim Frederick, K2GBR, and an extra-class ham. I showed her the pictures and articles. Then, though it was probably a bit presumptuous, I suggested that — as a YL herself — "Hutch" might be interested in tracking down more information about May and writing it up for the OTB. *Much to our delight, she graciously accepted the assignment and agreed to see what she might be able to find out. Now, thanks to her research, we have an excellent profile of this pioneering amateur radio operator.—MFE*

May Lillian Smith about 1908.

I returned home from the 1997 AWA Conference with an unexpected assignment from the *OTB*. Editor Marc Ellis and radio historian Bart Lee had come upon some 1920-vintage magazine and newspaper articles about May Smith. May was a pioneering YL ham who, judging from the pictures, presided over a "shack" that was state of the art and then some!

Marc wondered if I'd be interested in finding out more about May and writing up my findings. After my initial surprise at being pressed into service so suddenly, I really began to warm up to the project. Soon, I was in touch with various libraries, historical societies, historians and newspapers — but the meat of this article came from May's own relatives.

My search began at the Manchester, NH city library, which was able to provide a copy of May's obituary. The obituary identified May's birthplace in northern New York State, as well as a relative living near my own home town of Rochester, New York. That relative put me in

AUTHOR'S ADDRESS: 44 CREEK RIDGE, PITTSFORD, NY 14534

touch with another relative living in Boston, MA, who passed me on to yet another relative in Malibu, CA. From the California relative, I learned of more family in Albuquerque, NM and, coming full circle, also in Rochester!

After considerable correspondence with May's family, I was able to learn enough about this most interesting lady to put together the story that follows. The photos were provided by May's Malibu relatives. I hope you enjoy reading the story as much as I enjoyed researching it!

May's early 1920s ham shack. A magnifier on the original photo reveals that large framed item to left of window is an ARRL certificate. Her framed 1BAE call letters hang below it.

May Lillian Smith (1867-1952) was born on her parents' farm on the Oswegatchie River near Richville, NY. May was the youngest child of eleven children born to William Priest Smith and Sarah Porter Hungerford. Her father was a prominent lumberman, a Colonel in the Civil war and a three-term County Court Judge.

May's entry into the world of amateur radio was influenced by her brother, J. Brodie Smith (1861-1947), WlHPM, who was well known for his work in electricity. As early as 1880, still in her teens, she was a part-time operator on a private telegraph line that J. Brodie set-up in 1878. The line ran from May's house to the center of Richville, NY three quarters mile away. It was later extended two miles to a railroad depot. Thus, May had an early introduction into the world of telegraphy, an interest that captivated her for the rest of her long life.

May's father died in 1899. In 1901, May and her widowed mother moved to Manchester, NH, where other members of the family lived, including J. Brodie.

My search did not turn up the precise date that May was licensed as an amateur radio operator in New Hampshire. However, in 1920 she was known to have used the call sign "1DBE," and in a 1921 call sign book she was listed as "1BAE." Later she would become "W1BDN," using this call for the remainder of her life.

It appears that May was an amateur radio enthusiast before World War I. In *Radio News* for August 1920 May was quoted as follows: "I have been interested in radio amateurs for several years and as a result, I have graduated from the crystal-detector-tuning-coil stage to my present rather complete radiophone outfit. Of course the station was dismantled during the war but when the order went out to resume operation again, I did not hesitate to start in again with renewed vigor."

The "rather complete radiophone outfit" that May was using in 1920 consisted of a "½ K.W. Transmitter, a Rotary Spark Gap, an Oscillation Transformer and Transmitting Condenser." She also had a "DeForest type O., a.c. Radio Telephone and Telegraph Oscillion Transmitter" which gave her "excellent results."

Her receiver was a "DeForest Type T 100 Differentially Balanced Double Multi-wave Tuner, Type P 300 Combination Audion-Ultraudion and 1-step Amplifier, two Type P 2-step Amplifiers and one 6-volt storage battery with Tungar Rectifier for charging." May also had a Holtzer Cabot 3000-ohm headset.

Her antenna system was "of the T type, consisting of four wires No. 10 B.S. hard drawn copper, 100 feet long, spaced 3 feet apart, 42 feet high, with a 55 foot lead-in, and a ground 15 feet in length from the instruments." One of the photographs accompanying this article shows her Manchester amateur radio "shack" as it looked during this period (early 1920s).

There was great excitement in Manchester, NH, during the Harding presidential election in the fall of 1920. For the first time, election returns were received by "wireless telephone." May, operating as 1DBE, recorded election returns for Manchester well into the early hours of morning following the election. Radio propagation conditions were not the best for that election day evening, although this early communication

Photos courtesy Holly Cumberland, Malibu, CA.

public service event was deemed to be a success and was widely reported in the press.

In 1920, May conducted a radiophone experiment involving the transmission of music and conversation with a Dr. A. Gale Straw, another Manchester amateur radio enthusiast. They used a "talking machine" in their broadcast and were reported to have played the strains of "The Long Long Trail" over the air. Of course today it would be illegal to do this on amateur radio frequencies.

A noticeably older May poses in the much enlarged 1934 shack. Most, or all, of the 1920s gear is gone, replaced by state of the art equipment. Rack to left of desk sports W1BDN call letters.

May was an early member of the American Radio Relay League and the Young Ladies' Radio League. She received an official commendation from Styles Bridges, then Governor of New Hampshire, for her efforts in relief work during hurricanes and floods that devastated parts of New England during the 1930s. May held membership in the Manchester Institute of Arts and Science, now known as The New Hampshire Institute of Arts. (brother J. Brodie was one of the founders of this organization.)

May always had the latest and best radio equipment in her shack. She never married or had a career. The 1920 Federal Census for Manchester recorded her occupation as "none." According to contemporary relatives, she received financial assistance for her radio avocation from her very generous brothers, Jay Hungerford and J. Brodie.

Jay Hungerford was a pharmacist and later made a fortune in Ausable Forks, NY and Rochester, NY as a manufacturer of fruit juices or syrups for soda fountain use. His obituary can be found in the *Rochester Democrat and Chronicle* for April 2, 1932. J. Brodie, who was May's technical support, was a pioneer in electric power. He was the first superintendent of the Ben Franklin Electric Company of Manchester and a member of the managements of several other electric companies in the Manchester area. His obituary can be found in the *Manchester Union Leader* for May 9, 1947. The New Hampshire FM Association, Inc. still uses J. Brodie's call sign, WlHPM (he had been president of an earlier "ancestor" club).

While in her 80s, May was still active as W1BDN on 10, 20 and 75 meter phone and 80 meter CW. The skills she acquired as a teenage telegrapher on the line set up by J. Brodie served her well for the rest of her amateur radio life.

LODGING AND FOOD AT THE CONFERENCE

While the Marriott is clearly the most convenient location, other accommodations are available north of the hotel on or near NY 15. In order of proximity:

0.6 mi: Day's Inn, (716) 334-9300
0.8 mi: Red Roof Inn, (716) 359-1100
1.0 mi: Microtel, (716) 334-3400
1.0 mi: Highlander Inn, (716) 334-4280
1.1 mi: Super 8 Motel, (716) 359-1630
1.9 mi: Dorkat Motel, (716) 334-7000

Some restaurants in the area are Petals' at the Marriott, and the Cartwright Inn south of the hotel on NY Rt. 15. Fast food (Perkins, Burger King, etc.) is available in the motel area.

AWA Annual Conference

THRUWAY MARRIOTT, ROCHESTER, NY
SEPTEMBER 2-5, 1998

WELCOME BACK! At the 37th annual conference, collectors and history enthusiasts will convene, exchange equipment, and learn more about the development of radio and electronics. If you have never been to the yearly "reunion," why not give it a try? Rochester (Henrietta) is just north of upstate New York's beautiful Finger Lakes region, easily reached by car or plane. The site is 26 easy miles from the AWA Museum at Bloomfield.

Advance registration is encouraged. This will allow you to receive your conference packet with a minimum of delay, with pre-assignment of flea market spaces. Pre-registration, using the enclosed card, can be made through Richard Ransley, Box 41, Sodus, NY 14551 before Aug. 24. Unlimited registration at the door.

The conference site is the Thruway Marriott, which is a full-sized, full-service hotel. It offers special nightly rates ($88 single, $90 double, $90 triple, $100 quad) up to Aug. 14. For info or reservations, call (716) 359-1800. The Marriott has high-quality restaurant facilities, and other lodging and eating places are nearby.

The hotel is reached from Exit 46 of the New York State Thruway (I-90): take I-390 north to NY 253 west, to NY 15 south. For visitors arriving by air, the location is about seven miles or 15 minutes from the airport. There is shuttle service, 7 a.m.-11 p.m. (specify the Thruway Marriott).

The special theme for this year is "Zenith."

Conference Chairperson
BRUCE ROLOSON

Program Chairperson
LAUREN PECKHAM

Contest Chairperson
GEOFFREY BOURNE

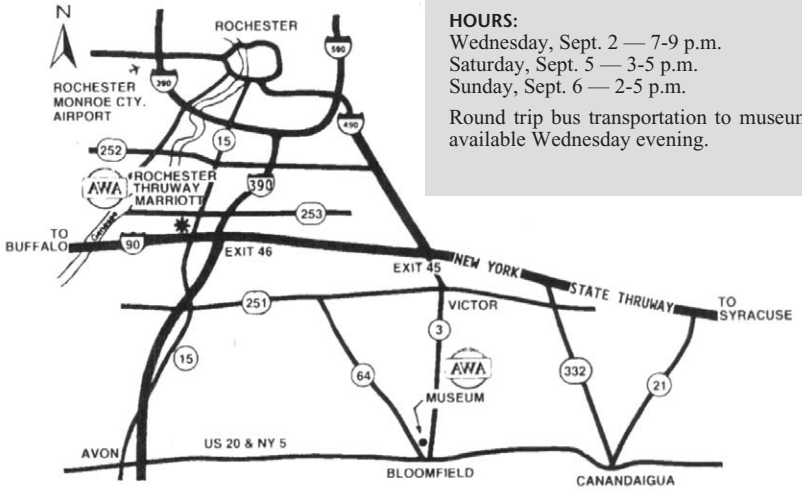
AWA ELECTRONIC COMMUNICATIONS MUSEUM

VILLAGE GREEN, BLOOMFIELD, NY

Refer to map at left. Directions from hotel: Right (south) on Rt. 15. At Avon (9.5 mi.), left (east) on Rts. 5 & 20. At Bloomfield (16 mi.), left at brown "Radio Museum" sign near Holloway House restaurant. Go approx. 200 ft. and park. Museum is on the left.

HOURS:
Wednesday, Sept. 2 — 7-9 p.m.
Saturday, Sept. 5 — 3-5 p.m.
Sunday, Sept. 6 — 2-5 p.m.

Round trip bus transportation to museum available Wednesday evening.



AWA Conference Agenda

WEDNESDAY (9-2-98)

6 a.m.—**Flea Market** opens (through 11 a.m. Saturday). Food service will be available on-site.(Wed. to Fri.)
6:50 a.m.—**Sunrise**
8 a.m.-5 p.m.—**Registration** for Conference—Assembly Corridor
8 a.m.-5 p.m.—**Book Fair**—Pre-assembly Court
1 p.m.—**The Zenith Windcharger.** *Dale Goodwin* will provide historical background on this interesting device. A sample unit will be on display—Seneca-Onondaga Rooms..
2:30 p.m.—**Shortwave History.** With *Bart Lee.* Always a very informative session—Seneca-Onondaga Rooms.
4:00 p.m.—**Key & Telegraph Seminar.** Moderated by leading key collector *Murray Willer* with a panel of collectors and historians—Seneca-Onondaga Rooms.
7-9 p.m.—**AWA Museum and Annex Open.** Bus leaves hotel at 6:30 p.m. Round trip fare, $10.00.
7:30 p.m.—**Zenith Transistor Radios and Literature.** A very complete story on this famous company by *Norm Smith*—Seneca-Onondaga Rooms.

THURSDAY (9-3-98)

8-9 a.m.—**Check-In** of equipment for Communications Equipment Auction—Cayuga-Mohawk Rooms.
8 a.m.-5 p.m.—**Book Fair**—Pre-assembly Court.
8 a.m.-Noon—**Registration**—Assembly Corridor.
9 a.m.—**Communication Equipment Auction.** *Col. Ed Gable*, K2MP, auctioneer. Post-1930 communications equipment, such as receivers and transmitters by National, Hallicrafters, or Hammarlund. No bidding card needed; sales are seller-to-buyer. ***No Items Containing Mercury!!*** —Cayuga-Mohawk Rooms
10:30 a.m.—**Early Radio Premiums, History and Collector Status.** A multimedia presentation by *Bill Ross*—Seneca-Onondaga Rooms.
Noon—**Ladies Lunch**, Program will be show tunes by pianist Ed Clute—Salon A.
1-5 p.m.—**Registration**—Assembly Corridor.
1:00 p.m.—**Demonstration of a Flying Spot Scanner and Receiver.** Presented by *Peter Yanczer*, this interesting program will show principles as originally worked out by J.L. Baird in 1928—Seneca-Onondaga Rooms.
3:00 p.m.—**H.J. Round and the UV-199 Tube?** *Jerry Vanicek* will bring little-known facts to light regarding the development of two well-known devices—Seneca-Onondaga Rooms.
4-7 p.m.—**Main Auction** check-in, bidder registration, and preview—Seneca-Onondaga Room. Registration and bidding card are good for all auctions on Friday. Registration fee of $2 credited toward any purchase. (This is the check-in time for the main auction.). ***No Items Containing Mercury!!***
4:30 p.m.—**Mahlon Loomis—The Opening of the Electromagnetic Spectrum.** Theory and demonstrations presented by *Dr. James F.Corum* and *Kenneth Corum*—Seneca-Onondaga Rooms.
7:30 p.m.—**Radio Restoration Clinic.** *Bob Macintyre* will show us how to get good results; a must for collectors—Salon C.
7-10 p.m.—**Old Equipment Contest**—check-in of entries—Henrietta Ballroom (Salons A, B). This is the time to bring in displays.

FRIDAY (9-4-98)

8 a.m.—**Auction Preview** (bidder registration and preview only)—Iroquois Ballrooms.
8 a.m.-5 p.m.—**Book Fair**—Pre-assembly Court
8-11 a.m.—**Equipment Contest Judging**—Salon A & B.
8:15 a.m.—**Annual Sightseeing Excursion**, tour and lunch ($49). Meet in the hotel lobby.
8 a.m.-noon—**Registration**—Assembly Corridor.
9 a.m.—**Vacuum-Tube Auction**—Iroquois Ballroom—Auctioneer, Walt Buffinton.
10:30 a.m. (±)—**Paper-Collectibles Auction**, continuing from tubes.
11:00 a.m. (±)-noon—**General Auction**, continuing from paper-collectibles; includes gear donated to support Museum maintenance. Auctioneer, Walt Buffinton.
11 a.m.-noon—**Equipment Contest Entries** open for viewing—Salon A & B.
1-4:30 p.m.—**General Auction** continues.
1-5 p.m.—**Equipment Contest Entries Viewing** continues - Salon A & B.
1-5 p.m.—**Registration**—Assembly Corridor.
3:30 p.m.—**Review OT Amateur Operation.** a fun time for all hams and a chance to discuss various activities—Salon C.
7 p.m.— Historical and Top Awards Banquet. Cash bar available. Various AWA awards will be presented. Special entertainment with the return of old-time radio shows. a fine program of music

and comedy directed by *Gary Yoggy* and again featuring *The Boogie Woogie Girls*.—Iroquois Ballroom.
9-11 p.m.—**Equipment Contest Viewing** continues - Salon A & B.
9-10 p.m.—**Auction Payment**—Assembly Corridor.
11 p.m.-midnight—**Equipment Contest Pickup**.

SATURDAY (9-5-98)

8 a.m.—**Book Fair**—Pre-assembly Court.
8 a.m.—**Equipment Contest Pickup**.
9 a.m.—**The Life of Alexander Graham Bell.** With noted producer and historian *Morgan Wesson*—Seneca-Onondaga rooms.
10:30 a.m. **Pre-1912 Wireless and Electrical Apparatus Display.** Moderated by Lauren Peckham. Members are encouraged to bring items and provide brief descriptions. Seneca-Onondaga Rooms.
Noon—**Finale Luncheon**—Luncheon with Contest Awards and Closing of the 36th Conference—Salon A & B.
2-4 p.m.—AWA Museum open.

SUNDAY (9-6-98)

2-5 pm—AWA Museum open.

FLEA MARKET POLICIES

Following are the policies that will be in effect for the 1998 flea market:

First, the market will run only in conjunction with the conference dates, from Wednesday morning to Saturday afternoon. *No* flea-market sales will take place at the hotel parking lot prior to Wednesday. The flea-market area will be sealed off, unavailable to anyone until the gate opens at 6 a.m. Wednesday. The prohibition of non-conference flea marketing is a matter of hotel rules and our Special Use Permit required by the Town of Henrietta. **NO ITEMS CONTAINING MERCURY!!**

Second, there will be only one class of site. All sites are treated the same and are issued randomly on a first-come, first-sold basis. Each member may pre-register for one or two sites, at $20 for the first and $35 for the second. Two sites to one member will always be adjoining. Pre-registration is highly recommended to assure a pre-assigned, numbered spot on the paved area. Everyone wanting to participate will get a spot. However, the paved-area, pre-numbered spots will probably sell out during the preregistration period. At that point we will start assigning spots on the grass on the Thruway side of the parking lot.

Third, flea market headquarters will be located at the entrance to the market. Look for the big banner. This will be a full-service area where one can pay membership dues and registration fees, and sign up as a flea-market seller. **Everyone needs to register for the conference — the flea market is only a portion of overall conference activities. A non-member wishing to sell in the flea market is welcome to join, paying $15 dues, $19 conference registration, $20 for the first site and $35 for the second site. (Site assignments dependent on availability.)**

RULES AND CONDITIONS

EVENTS: Admittance to any activity, flea market included, requires a registration badge.

FLEA MARKET: Opens 6 a.m. on Wednesday. **NO ITEMS CONTAINING MERCURY**. New York State sales tax forms will be available. AWA not responsible for sales or tax. Neither AWA nor the Marriot is responsible for the security of personal property in the flea market area. We are asked to confine market activity to the designated area to avoid the NY State Thruway right-of-way. KOA and other camp grounds are available in the vicinity. No overnight sleeping in the flea market area.

ANNUAL SIGHTSEEING TOUR

The tour this year will leave the hotel Friday, September 4 at 8:15 a.m. and take you to the beautiful community of East Aurora. The tour will include a tour of the Roycroft Campus, where the Roycrofters arts and crafts of the 1890s were done. Lunch will be at the Roycroft Inn. Furnished in oak and wicker, it is one of western New York's finest. You may not want to leave. You will also want to visit the Millard Filmore House, as well as the Baker Church with its beautiful Tiffany windows. Spend some time at Vider's 5 & 10 cent store to complete your day. This is a trip you will remember for a long time. Cost: $49, includes transport, luncheon, tips, etc. Sign up early using the AWA registration card.

1998 ANNUAL CONFERENCE – EASY REFERENCE

	WEDNESDAY SEPT. 2	THURSDAY SEPT. 3	FRIDAY SEPT. 4	SATURDAY SEPT. 5
6 a.m.	Flea market opens			
8 a.m.	Registration; Book Fair	Registration; Book Fair; Check in For Communication Equipment Auction	Registration; Book Fair; Auction Preview; Contest Judging	Book Fair Equipment Contest Pickup
8:15 a.m.			Sightseeing Excursion	
9 a.m.		Communication Equipment Auction	Vacuum Tube Auction	Life of Alexander Graham Bell
10:30 a.m.		Early Radio Premiums, History & Collector Status	Paper Collectibles* Auction	Pre-1912 Wireless and Electrical Apparatus Display
11 a.m.			General Auction* Equipment Contest Viewing	
Noon		Ladies Lunch		Finale Luncheon
1 p.m.	The Zenith Windcharger	Registration; Flying Spot Scanner Demo	General Auction and Equipment Contest Viewing Continue; Registration	
2:00 p.m.				Museum open 2:00 - 5:00 p.m.
2:30 p.m.	Shortwave History			
3 p.m.		H.J. Round and the UV-199 Tube?		
3:30 p.m			Amateur Radio Topics	
4:00 p.m.	Key and Telegraph	Check-in For Main Auction		
4:30 p.m.		Mahlon Loomis		
6:30 p.m.	Bus to Museum			
7 p.m.	AWA Museum open	Check-in For Old Equipment Contest	Annual Historical Banquet; Awards, Old-Time Radio Shows	
7:30 p.m.	Zenith Transistor Radios and Lit.	Radio Restoration Clinic		
9 p.m.			Equipment Contest; Auction Payment	
11 p.m.			Equipment Contest Pickup	

*Starting time approximate

The Zenith Corporation

By Geoffrey Bourne and Ralph Williams, N3VT

The AWA Old Equipment Categories for the 1998 contest are divided into two major groups: Theme and Standard. The Theme categories reflect the Conference's central historical purpose: a review of the products and history of The Zenith Corporation.

This year we will continue with the Standard categories: Receiver, Transmitter and Craftsman. As in past years, the receiver categories will be delineated by number of tubes, and we will have two transmitter categories: Spark and CW. The Craftsman categories provide a showcase for our many members with special skills in conservation and restoration.

The Theme Categories

1. The Early Years — 1920s.

A. Battery Sets. In the infancy of the industry, radios were powered by battery. Companies made great strides in improving the technology for better reception and, most important, for greater battery life. A model 3-R , 4-R or any Zenith battery set can be entered.

B. A.C. Sets. When a.c. power became available, the radio industry took off. Now it was possible to listen to the radio at any time and for as long as desired without having to worry about the batteries going dead. Any Zenith a.c. radio can be entered. i.e. model 14E, 62, 72,…

2. The 1930s.

A. Tombstones. This is the time of affordable radio; now almost anyone could buy one. A good example from this era would be a "Walton set."

B. Cathedrals. The classic example of an antique radio; highly collectable, unique in design. A good example would be a "Zenette."

C. Black Dial Consoles and Chairsides. The big black dial was the Zenith design statement and represented a breakthrough in dial readability. This style was used for many years. A great example would be a "Stratosphere."

3. The 1940s.

A. Pre-War. Small wood and Bakelite sets would be appropriate.

B. World War II Production. Like most companies, Zenith converted its manufacturing lines to military production during the war years. Examples of the military radios belong here.

C. Post-War. After the war ended, Zenith resumed production of household radios. The inexpensive wood and plastic "baby boom" sets are good examples.

4. The 1950s.

A. Consoles: Radio and Record Player. During the 1950s, more emphasis was put on the quality of the sound reproduction. The introduction of FM led Zenith to a new level of household radio quality.

B. Transistor Radios. With the invention of the transistor, the portable radio entered a new era. The new personal "play anywhere" sets had small size, light weight, and previously unheard-of battery life. Bring in those transistor radios!

C. Table Top Radios. The "All American Five" design made for an inexpensive radio. It was what every kitchen had to have. Bring in a Zenith example.

5. The Transoceanic.

The "Transoceanic" was one of the most popular portable radios of all time. We are looking for a display of the variations in the models or just a single outstanding radio. Be inspired.

6. Television 1940-1960.

Bring in a significant black-and-white or color Zenith TV, with its history.

7. Company History.

In this category we are looking for company information, sales quotes, engineering documents, technical information bulletins or other documents to add life to the company.

8. Advertising and Customer Documents.

Customer-oriented documentary artifacts such as magazine ads, dealer displays, give-aways, descriptions of radio or television programs and product instruction books.

The Standard Receiver Categories

9. Passive Receivers.

Any detecting device, not including vacuum tube or solid state amplifying devices, whose purpose is to convert radio energy into intelligent signals.

10. One- and Two-Tube Receivers.

Any receiver which uses one or two tubes for any of its functions. A tube or valve that includes

more than one electron stream in a single envelope will be counted as one tube.

11. Three-Tube Receivers.

The detector-two-stage radio is the most often found example in this category, but reflexes and special circuit sets are sought.

12. Four- and Five-Tube Receivers.

Many radios from all periods can fit here, not just three-dialers. Electric radios that show some special feature will be welcomed.

13. Receivers With Six or More Tubes.

Superhets are the usual entries in this class but many other sets qualify, especially the electric radios of the thirties. Most communication receivers can be entered.

14. Novelty Radios.

Entries here can range from Mother's Oats crystal sets to Teddy-bear transistors, leavened with goodly doses of the All-American Five.

15. Speakers

A. Horn. Any sound reproduction device can be entered here as long as it employs a horn or bell for sound amplification.

B. Cone. When radio sets reached greater power output levels, the magnetic speaker unit was designed with large surface areas for better sound reproduction. There are many fine examples of this type of speaker. i.e. Tower Adventurer, Western Electric,…

The Transmitter Categories

16. Spark Transmitters and Artifacts.

Do not hesitate to enter a major piece of spark equipment if you think it is rare or historically significant.

17. Vacuum-Tube Transmitters.

Some of the sets for this class are old, some not so old, most home-built. While the predominant entries have been amateur-operated, commercial equipment is welcome.

The Craftsman Categories

18. Restoration of Appearance.

The purpose of this category is to display examples of rebuilding and refinishing the cabinets and containers that were used to house radio receivers. There is no requirement for a particular kind or size of set to be entered. A description of the work done will be considered an important part of the entry. The critical element is the appearance of the radio, including woodwork, escutcheons, dials, knobs and other visual details

19. Restoration of Operation.

This is the category for those craftsmen who artfully substitute modern components for old failures. The new electrolytic in the old can is an excellent example. Another is the transistorized tube. Perhaps the replacement of pot-metal parts by silver-gray colored epoxy castings has been accomplished by one of us. If so, please bring in the set that incorporates that restoration. An entry should be accompanied by documentation showing the basis of the update that preserves the quality of the original.

20. New or Rebuilt.

Previously we have encouraged entries that showed the conference attendees how substitutions and reconstructions would provide vital parts or pieces. We also encouraged craftsmen who had made an old function come alive again to bring their work for review. Do you remember the Federal receiver that was entered several years ago and the operating Marconi coherer detector from the year before last? We want to continue that tradition so bring in your retrospective designs and your reconstructions. There is no requirement for particular devices or circuits.

The Contest Awards

■ **Elle Craftsman.** Given in memory of Bruce Elle to a builder of a high-quality radio receiver of an old or new type.

■ **Matlack Transmitter.** Given for excellence in constructing or restoring transmitting equipment.

■ **Display.** Recognizes the informational value and quality of an exhibit in the contest at the AWA conference.

■ **Thompson Best of Show.** Awarded in honor of early amateur Eunice Thompson, W1MPP, for the top entry in the Old Equipment Contest at the Annual Conference.

■ **People's Choice.** Awarded to the entry that receives the most favorable votes from attendees and visitors to the contest. All entries, including displays are eligible for this award.

■ **ARCA Houck Superheterodyne Receiver.** Awarded in recognition of what is judged to be an outstanding entry in this category.

BY LARRY BABCOCK

THE AWA BRADENTON MEET

I wouldn't drive all the way from Buffalo, NY just to attend the AWA meet in Bradenton, Florida. But since my wife and I are ready for some warmer weather by late winter, we take the month of March to go south. This makes attending the Bradenton meet much more practical and we decided to return to it again this year. It was held at the Stewart Elementary School on 14 March. About 50 tables were filled with antique radio artifacts.

Here's a general shot of the folks milling around at Bradenton (March 14, 1998).

We arrived at 8 a.m. to find many other collectors already present and many sellers already set up. We received a very good first impression when we learned the entrance fee was a mere $5. This included myself and my wife, a flea market table and all the coffee and donuts we cared to consume during the course of the morning! The meet was organized by Norm Smith and advertised in *ARC,* making it known to a large group of collectors. I was surprised to find that Ron Frisbie, another AWA board member was also in attendance.

Being on an extended trip I was not able to bring a lot of stuff for the flea market, but I did have one tote box of smaller interesting items including tubes, unusual head sets, and early 1920s radio magazines. I sold at least a third of it.

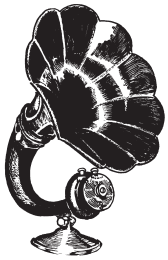
The most interesting item I saw sold was a coherer! I was asked whether I thought it was authentic. There was no ID and the tapper included a 3" bell mounted on a separate wood base. It and the glass tube with metal filings were both mounted on another wood base. A tag under the base gave a description of coherers. This was the first coherer I had ever seen for sale. It looked nice but was probably homemade. Does the tapper device usually include the actual bell? The general consensus was that it was probably authentic. It sold for $175.

My only purchase was a Motorola Airboy. I liked it because it is very similar to the small maroon Motorola model 5A1 that I carried all through Europe during WW II. The 5A1 uses minature tubes and came out just before the war. The a.c. version was manufactured after the war. The Airboy has a black front panel with an antenna jack that looks like a car radio jack. There is a phone jack and the dial is calibrated between

(continued on page 43)

My wife Dot (left) runs our flea market table. She gets to keep whatever she takes in! Meet organizer Norm Smith stands at right.

AUTHOR'S ADDRESS: 8095 CENTRE LANE, EAST AMHERST, NY 14051



THE LOUDSPEAKER

EDITED BY **FLOYD A. PAUL, W6THU**, 1545 RAYMOND, GLENDALE, CA 91201
PLEASE INCLUDE SASE FOR REPLY.

Trinity Radio Company

THE TRINITY
LOUD SPEAKER
Perfect Reproduction
No Distortion
Type "B" $12.50
Comprises the working parts of Type "A" so arranged that it can be mounted into your set or used with phonograph.
Type "A" $25.00
Pleasing design and rich mahogany crystaline finish make it an addition to your set that you will take pride in.
The Trinity Loud Speaker is an instrument that combines the best qualities of a phonograph reproducer in combination with electro magnetic principles best fitted for radio amplification. Absolutely perfect reproduction of all music and speech without distortion. The volume may be regulated from that required for a room in your home to a tremendous output that can be heard hundreds of feet out of doors by simply increasing "B" battery voltage. No storage batteries required. The instrument is of a heavy duty type and is guaranteed fully by the manufacturers.
Ask your dealer for demonstration
—if he cannot we can
TRINITY RADIO COMPANY
168 Dartmouth Street, Boston, Mass.

The Type A was the original Trinity horn. Note that driver was available separately (Type B) for use with phono horns.

It wasn't until Dave Crocker of Mashpee, Mass. wrote to me about his most recent horn find, a Trinity, that I decided to write about the Trinity Radio Co. In addition to his photo of the late Trinity, Dave sent me copies of early ads by the company.

Advertising by Trinity began in December of 1922, when the company first advertised their square-neck-and-squarish bell horn (Type A). It is interesting to note, on the Type A ad shown here, that the Type A driver unit, called the Type B, was available separately for use with phonograph horns.

Alan Douglas wrote to me about his Trinity Type A in 1980. The original color of the bell and neck was red mahogany, as verified by Dave Crocker. The metal neck and bell made the speaker top-heavy and in late 1923 the company came out with a rounded fibre neck and bell. It

Dave Crocker's late model Trinity. Has anyone seen an ad for it?

The TRINITY
LOUD SPEAKER
The Trinity Loud Speaker is an instrument that combines the best qualities of a phonograph reproducer in combination with electro-magnetic principles best fitted for radio amplification.
Perfect reproduction of all music and speech without distortion. No storage batteries required. The instrument is of a heavy duty type and is guaranteed fully by the manufacturers.
For sale by good dealers.
Literature upon request.
TYPE A1
$25.00
21" Fibre Horn
TRINITY RADIO CORPORATION
446½ Tremont Street, Boston, Mass.

Trinity released the Type A1 in late 1923.

THE TRINITY LOUD SPEAKERS
Interior Construction of all Trinity Speakers
AN ear phone is an ear phone no matter how fancy the horn that covers it may be, and, due to the delicate construction of an ear phone, it is utterly incapable of giving true tone reproduction, especially when relatively large currents are passed thru its coils, such as the output of a two-stage or power amplifier.
The Trinity Loud Speaker element embodies the well-proven principles of the phonograph reproducer with the soundest principles of electro-magnetic design best adapted for loud speaker operation. It is not an ear phone when placed on a head band and a loud speaker when covered with a horn. It is a sturdy loud speaking element always. Send for literature.
TYPE "C 2"
21" Fiber Horn $30
TYPE "S"
Phonograph Unit $12.50
TRINITY RADIO CORPORATION
446 TREMONT ST., BOSTON, MASS.

The Trinity Type C2 made its debut in 1924.

was called the Type A1. Its base and driver seemed to be identical to those of the Type A.

By February of 1924, the Type C2 horn was released. It had a 21" fiber bell and neck, same as used on the Type A1. The base was modified to about 8" square and was a dark-stained walnut-type wood. With its wider base, the Type C2 horn was much more stable than earlier models.

Recently Dave Crocker found a new model, not advertised in contemporary magazines. Perhaps it could be called it a C3? The 15" metal goose-neck shaped bell has a maker's decal in the inner lip. It was likely made in 1924.

This firm began business as Trinity Radio Company and was located at 168 Dartmouth St., Boston, Mass. By February of 1924, it had changed its name to Trinity Radio Corporation and was located at 446 Tremont St. in the same city.

I'd like to hear from readers who may have Trinity advertising documenting Dave's latest find or other Trinity models we don't now know about.

***AWA BRADENTON**, continued from page 41*

20 and 40 including a "TWR" setting at 28. Does "TWR" stand for "tower"? I would expect so.

The chassis of both sets are almost identical except for the rf input circuit. A tag inside the rear cover identifies the Airboy as a Motorola product (Model AR-96-23). Can anyone tell me how the Airboy was used? It is a hand-carried portable with no provision for mounting, but has an rf input for a whip antenna with shielded cable.

If you happen to be in Florida in March, consider attending this meet. It is of moderate size but is probably the most sociable group of collectors I have met anywhere. There were even a father and son from my small home town of Jamestown, NY. They recognized my name, and it turned out that they knew of my father, who operated a radio store in Jamestown from the 1930s to the 1960s!

On our way south we always stop and visit my brother Ted near Roanoke, VA. Ted is also a collector, and has built a sizable addition to his house to house his better items. Ted worked for Stromberg Carlson and, not surprisingly has become a Stromberg specialist.

A corner of brother Ted's collection. How many S-C items can you spot?

BY PAT LEGGATT

How Radio Became Wireless

Part 2 —Theory Becomes Practice

In Part 1 of this story, published in the May, 1998 OTB*, author Leggatt described the development of the theoretical underpinnings for the propagation of radio signals. Part 1 ended with Oliver Lodge's late-1880s experiments demonstrating the existence of electromagnetic waves. Now, in Part 2 (the conclusion), Leggatt reviews the emergence of a practical technology for using these waves to send and receive messages, ending with the development of reliable wireless telegraphy in the early years of this century. —MFE*

Heinrich Hertz

At the same time as Lodge was undertaking his experiments, there were even more effective investigations being carried out by Heinrich Hertz in Germany. Hertz, the son of a lawyer, was born in February 1857. At the age of seventeen he developed a strong interest in and talent for oriental languages and almost decided to study for a career as an orientalist.

However — and fortunately for the future of communications — he turned eventually to science with a year's course at Munich, transferring in 1878 to the University of Berlin. Here he studied under Professor von Helmholtz, who gave much encouragement to one he recognized as an outstanding pupil. Finally, having been awarded his Doctorate, Hertz was appointed assistant professor at the Physics Institute of Berlin in 1880.

Hertz had been brought up in the "instantaneous-action-at-a-distance" school of thought, but fairly early in his career he was introduced to Maxwell's theories by his professor von Helmholtz who encouraged him to attempt experimental proof of Maxwell's postulated "displacement current" in air or empty space. Hertz did not immediately take this up, but he was intrigued by the possibility that the concepts of displacement currents and electromagnetic waves could fundamentally change "action-at-a-distance" theories.

Heinrich Hertz

A few years later he had been appointed Professor at the Technical High School at Karlsruhe and found there in a collection of old physical apparatus a pair of Knockenhauer Spirals, flat coils wound in wooden frames. Experimenting casually with these, he noticed that discharging a Leyden jar through one of the coils gave rise to a small spark across the open terminals of the other some distance away. This revived his earlier interests and he began to devote effort to theoretical clarification of Maxwell's equations. He became increasingly convinced that the equations could indeed give the true explanation of electric and magnetic field phenomena, and by 1884 he wrote "I think we may infer without error that if the choice rests only between the usual system

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of electromagnetics and Maxwell's, the latter is certainly to be preferred."

But the physical existence of electromagnetic waves, and especially their finite velocity of propagation, needed to be established by practical demonstration, so Hertz undertook a series of experiments culminating in the famous ones of 1887/88 which proved the point beyond all doubt. It is true that others before him had, rather accidentally, observed electromagnetic radiation, notably Mahlon Loomis in America in 1872 and David Hughes in England in 1879, but neither of them understood what was happening or were familiar with Maxwell's work.

Hertz's investigations into the subject had involved generation, detection and measurement of waves in free space, rather than along wires. Lodge generously acknowledged that Hertz's experiments were superior to his own and a more convincing proof of the validity of Clerk Maxwell's theories.

David Edward Hughes

After his experiments Hertz undertook further theoretical interpretation and development of the Maxwell concepts, much helped by his correspondence with FitzGerald, Lodge and Heaviside which revealed significant earlier work by these Maxwellians which he had not previously heard of. Hertz's papers in 1890 were particularly important in the field of theoretical physics and were influential in setting the scene for the later achievements of Lorentz and Einstein. Hertz died in 1894 at the early age of thirty six.

Hertz was not primarily an experimentalist seeking to demonstrate the existence of electromagnetic waves. He was a theoretical physicist who conducted his famous experiments as a means of justifying his firm conclusion on a matter of fundamental scientific importance. The waves were not important to Hertz for their own sake: he saw them simply as affording proof that Maxwell's equations gave the true picture and that hitherto accepted theories of "action-at-a-distance" must therefore be regarded as obsolete.

The three "Maxwellians," Lodge, FitzGerald and Heaviside, were of a like mind. They were satisfied with the fact that Hertz had experimentally demonstrated the real existence of electromagnetic radiation, and neither they nor Hertz himself concerned themselves with any possible practical applications such as communication.

Someone soon did however, in the shape of Richard Threlfall who, as President of the Australasian Association for the Advancement of Science, proposed in 1890 using Hertzian waves for communication purposes. But no one else saw this as a practical proposition at the time, the range of a few yards achieved by Hertz in his Karlsruhe laboratory not seeming to promise very much.

Guglielmo Marconi

Wireless Begins With Marconi

Five or six years went by with nothing very significant happening until Hertz's death in 1894. But ironically there was one further event involving Hertz which had a most profound impact. In that year the 20-year-old Guglielmo Marconi, on holiday in the Italian Alps, read an obituary describing the work of Hertz. He was immediately inspired to consider whether Hertzian waves might not form the basis of

a wireless telegraph communication system, and dedicated himself to this idea for the rest of his life.

At the end of his holiday Marconi returned to the family home in the Villa Griffone near Bologna, and at once commenced experiments in his attic workshop where he had long since occupied himself with the electrical devices which had fascinated him from boyhood.

It is a well-known story how Marconi improved his apparatus and techniques to achieve greater and greater ranges during 1894/95; how he came to England in 1896 to make further progress; and how he spanned the Atlantic with the letter "S" in Morse in 1901. This story need not be told again here, but Marconi's relationship with Oliver Lodge is perhaps less well known and may usefully be described.

Lodge and Coherers

Although it was Hertz who first contrived to demonstrate the existence of electromagnetic waves in free space and that they exhibited reflection and refraction in the same way as light, it is true to say that Lodge knew and understood as much or more about the nature and behavior of the waves than anyone else in the latter years of the 19th century.

As already mentioned, Lodge was thoroughly conversant with resonance and tuning, and he also well understood the principles underlying radiation from antennas of various configurations. Although he knew that waves must be radiated into free space, he lacked any means of detecting them; and it was use of the crude, but just adequate, resonant spark gap detector that enabled Hertz to effect his splendidly successful experiments.

Edouard Branly

But in 1889, the year after Hertz's demonstrations, Lodge made a discovery which was to prove a crucial step forward on the path to a practical wireless communication system. During his investigations into lightning and the analogous effects of spark discharges from Leyden jars, Lodge observed that two iron spheres or other metal surfaces in very close proximity would at times fuse together to form a conducting path when subjected to a Hertzian wave pulse. He called this arrangement a "coherer," saying that it formed "an astonishingly sensitive detector of Hertzian waves."

Later, in 1893, he was made aware of the work of Edouard Branly in France who had observed similar cohering effects with a glass tube filled with metal filings. Lodge immediately tried this for himself and found it very much more sensitive than his own iron spheres. In fact the phenomenon of coherence resulting from nearby spark discharges had been independently noticed by others some years earlier, including Guitard in 1850, Varley in 1866 and Onesti in 1874; but these predecessors had not in fact ascribed the effects to Hertzian waves, and neither had Branly in his 1890 experiments.

Branly was upset that his name "radioconducteur" was superseded by Lodge's "coherer," but the latter became standard usage. In 1902 Lodge, in conjunction with Alexander Muirhead, invented a new form of coherer in which a knife-edged steel wheel grazed the surface of a small pool of mercury covered with a film of oil. An incoming radio pulse ruptured the thin oil film and allowed low-resistance contact between the steel and the mercury. This type of coherer was at least as sensitive as any other and a good deal more stable in operation.

Lodge did not at the time attempt to put his coherers to practical use, but Marconi used a filings version in his early apparatus. It was this, plus the use of elevated antennas and connection to earth, which enabled Marconi to develop and steadily improve his equipment to the point where it could be seen as a viable wireless communication system.

Lodge Versus Marconi

Marconi came to England in 1896 as a young man of nearly 22, with little theoretical knowledge of wireless principles but brim full of enthusiasm and dedication. He had a flair for publicity and in December gave a demonstration to members of the public, carrying a black box round the audience which rang a bell whenever a key at the end of the hall was depressed. Representatives of the press were present and the next day Marconi was headline news, hailed as the inventor of wireless.

In fact Marconi was always quite modest and did not claim to be an inventor but rather that he "took up other people's ideas and inventions and improved them." But Lodge, and other scientists who had made significant contributions in the field, was naturally indignant about the adulation of a young Italian upstart. Lodge may thus be forgiven his testy comment in later years that "It was stale news to me and to a few others" but he then added more generously "But whereas we had been satisfied that it could be done, Marconi went on enthusiastically and persistently till he made it a practical success."

Another area of interplay between Marconi and Lodge was tuning. As already mentioned, Lodge had a full understanding of the principles of resonance and tuning and in May 1897 he applied for a patent on his "syntony" ideas.

Tuning, and the resultant ability to separate one transmission from another, was of course a vital necessity for the development of Marconi's wireless system and he tried many different circuit arrangements with gradually increasing success. Finally in 1900 his famous "four sevens" patent was granted.

It may appear strange that he was granted this patent when Lodge had registered his some years earlier; but it seems that it was not considered that one infringed the other, and it was ruled in court that the two were complementary rather than duplications. Nevertheless the existence of Lodge's patent was seen as an embarrassment by the Marconi Company, especially when its validity was extended in 1911 by a further seven years. Accordingly Marconi's negotiated with Lodge and bought up his patent for a considerable sum.

Alexander Muirhead

The Lodge–Muirhead Syndicate

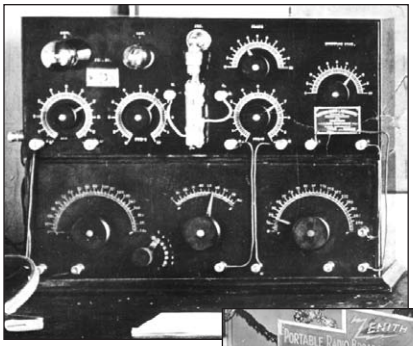
Another source of rivalry was the appearance of the Lodge-Muirhead Syndicate with a competing wireless telegraphy system. Although Lodge was basically uninterested in commercial exploitation of his Hertzian wave experiments and discoveries, such a thing was suggested to him by Dr. Alexander Muirhead after he had attended one of Lodge's lectures in 1894. This eventually resulted in formation of the Lodge-Muirhead Syndicate in which Lodge provided the scientific ideas and Muirhead — a very able telegraph engineer — the design of practical equipment.

By 1903 the Syndicate was ready with a well-designed and effective system incorporating the Lodge steel-mercury coherer, but they found themselves up against the Marconi Company's United Kingdom coastal station monopoly, which they had negotiated with Lloyds of London from 1901, and the Company's contracts with many shipping lines for exclusive use of Marconi equipment and operators.

Faced with this situation, the Syndicate could find only limited markets in the military field and in a few overseas countries. So despite its technical excellence, the Lodge-Muirhead system was not a commercial success and was wholly bought out by the Marconi Company in 1911, together with the Lodge tuning patent referred to above. As part of the deal, Lodge was appointed Scientific Adviser to the Marconi Company, but it is not on record that his advice was ever sought!

So by the early years of the 20th century, wireless telegraphy was well established and went on with ever increasing development up to the new "radio" era of the 1920s; and beyond this to the all-pervading presence we experience today.

A Zenith Photo Album:



1919 Chicago Radio Labs (forerunner of Zenith) Z-Nith receiver as installed at company's ham station 9ZN. At that time, radio hams were the firm's main customers.

Portable broadcasting station (aboput 1925) covered special events, livening the programming of Zenith's pioneer broadcasting station WJAZ.

Stylishly bobbed young lady picks up a bedtime program on a 1925 Super-Zenith Model IX battery set.

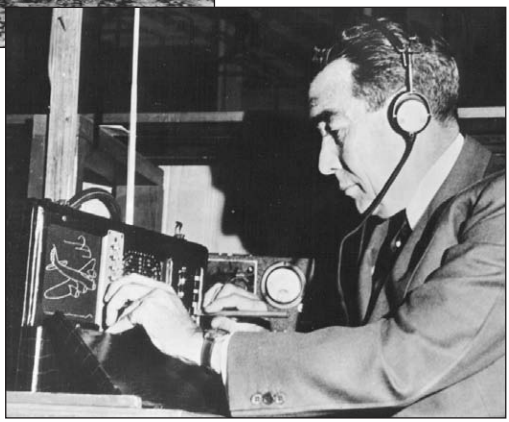
Idealized 1940s family enjoy Fiber McGee and Molly on a beautifully-grained 12S569 shutter dial as the storm clouds of war gather in Europe.

ALL PHOTOS COURTESY ZENITH ELECTRONICS CORPORATION.

1919 to World War II

Gallery of Zenith classics includes — from left — the "Portola" chairside (1936), the Charles II motif Model 64 (1931), the Model 40A, inspired by the Italian Renaissance (1930), and the Model 60 (1929).

Bevy of pretty flappers gives a good send-off to the just-released 10-tube all-electric set (1927).



The last 1941 Trans-Oceanic rolls off the assembly line with thousands of orders for the model still unfilled. After that, Zenith converted 100% to war production.

BY D.K. OWENS

BUILDING A BROADCAST-BAND GRID DIP METER

Introduction

A grid dip meter is a compact, hand-held oscillator whose tank coil is mounted in such a way that it can be brought near a tuned circuit. A meter indicates the oscillator grid current. When the oscillator and the unknown circuit are tuned to the same frequency, the unknown circuit absorbs energy from the oscillator causing the grid current to decrease or "dip." The oscillator is calibrated so that the resonant frequency of the unknown circuit can be quickly noted.

Grid dip meters were once sold by Heath, Eico, and others, and are sometimes found at swap meets. For decades, every issue of the *Radio Amateur's Handbook* gave instructions for building one. The commercial and *Handbook* versions have several drawbacks. They use vacuum tubes and require a separate power supply or a line cord. All versions seem to use the Colpitts oscillator circuit with a split-stator tuning capacitor, which is hard to find. Intended mainly for ham use, grid dip meters were sold without broadcast band coils, though Heath and Eico did sell such coils separately. Unfortunately, swap meet meters rarely have them.

I needed a grid dip meter covering the broadcast band to diagnose tuning problems in antique radios. I wanted it to be battery powered to avoid line cords or separate power supplies. I also wanted to use easily available or "junk box" parts, which meant no split-stator capacitors. The 1978 *Radio Amateur's Handbook* (p. 520) gives an FET version of a grid dip meter, but it uses the Colpitts circuit and the coil specifications are only for the ham bands. Though this circuit didn't meet my requirements, it did give me some ideas.

The Circuit

After a look at the junk box and much breadboarding, I settled on the circuit in Fig. 1. It is an FET version of the grounded-plate Hartley oscillator. The drain is grounded for r.f., and feedback is from the source to the gate via a tapped tank coil. Instead of measuring grid (gate) current, I chose to measure drain current. With a fresh 9V battery and the circuit oscillating freely, the drain current is approximately 1.4mA and decreases as energy is absorbed by a nearby resonant circuit. If too much energy is absorbed, the circuit stops oscillating. At this point the drain current is

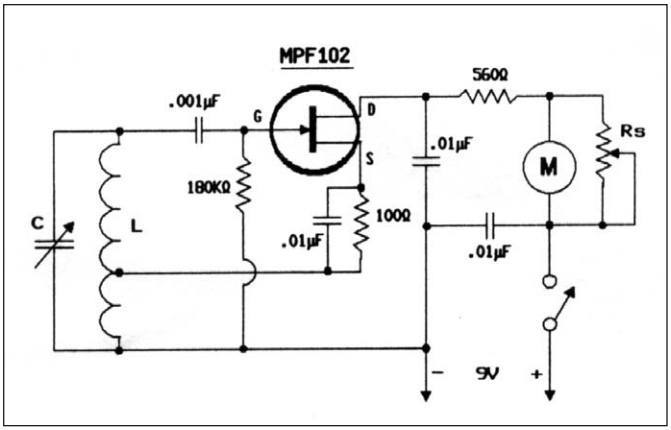


Fig. 1. If you have a well-stocked junk box, you probably already have most of the parts for this simple GDO.

AUTHOR'S ADDRESS: 478 SYCAMORE DRIVE, CIRCLEVILLE, OH 43113

about 0.4mA. Thus an easily visible change in drain current occurs when the oscillator tank coil is brought near a circuit resonant at the same frequency.

Construction

Parts values are indicated on Fig. 1. L is a tapped ferrite antenna coil of the kind used in many transistor radios. You can probably salvage one from a junker radio. C is a single-gang 365pF variable capacitor of the sort commonly sold for building crystal sets. The fixed capacitors are ceramic. The meter, M, can be anything from 1mA to 50μA DC. The meter shunt, Rs, is a 10-turn Trimpot whose value is 500Ω for 1mA to 500μA meter movements and 200Ω for more sensitive movements. Construction details are up to the builder. I built my version into a plastic case from Radio Shack.

A PC board for the electronics was made by hand-drawing the traces with etch resist on copper-clad board followed by etching. The PC board was cut to fit the slots inside the box. The variable capacitor was mounted on a piece of plastic sheet fitted into the internal slots below the circuit board. The tank coil was mounted on one end of the box so it could easily be brought close to unknown coils. The plastic cover from a lipstick tube was cemented over the tank coil to protect it. Fig. 2 shows the interior construction. The trimmer capacitor at the left of the main variable capacitor was incorporated during construction in case it was needed for calibration. It proved to be unnecessary and is omitted from the diagram.

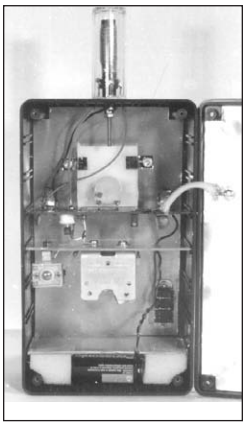


Fig. 2. Interior view of the unit. Calibration trimmer to left of the main tuning capacitor proved to be unnecessary.

I used a 100μA meter with arbitrary 1-10 graduations. The meter graduations are immaterial since we are looking only for changes in meter reading. The front of the unit is shown in Fig. 3. A knob attached to a plastic disk painted flat white was mounted on the capacitor shaft. The inside front and back of the case were lined with copper foil to eliminate any potential hand capacity effects.

Fig. 3. Attractive appearance of finished unit belies its home-brew origin.

I strongly recommend breadboard testing if you decide to build this instrument. Your coil-capacitor combination won't be the same as mine, so you must be sure that the circuit oscillates strongly over the entire broadcast band. Some adjustment of the gate and source resistor values may be necessary for reliable operation.

Calibration and Operation

The completed instrument was placed near the antenna lead of a communications receiver and tuned through its range to make sure it oscillated over the entire broadcast band. The meter shunt, Rs, was adjusted for full-scale indication with the circuit oscillating freely. The instrument was then calibrated by listening to its output on the communications receiver and marking the frequency with India ink on the white disk attached to the tuning knob. If you have a frequency counter, you can attach a small pickup coil to it and use it for calibration.

When determining the resonant frequency of an unknown tuned circuit, the unknown circuit *must be de-energized*. Bring the dip meter coil near the coil of the unknown circuit and tune the meter until you get a dip in meter reading. The dial reading is the resonant frequency of the unknown circuit. If you hold the meter coil too close to the unknown, the dip will be so broad that the frequency reading won't be accurate. The meter may even stop oscillating. The coupling should be close enough to produce a perceptible dip, but no more. Since it is a calibrated oscillator, the meter can also serve as a source of unmodulated r.f. for signal tracing.

KEY AND TELEGRAPH

EDITED BY **ROGER W. REINKE**, 5301 NEVILLE CT., ALEXANDRIA, VA 22310-1113
PLEASE INCLUDE SASE FOR REPLY.

A Fresh Face Finds Few Fans

Patrick B. Delany of Philadelphia was an active inventor of things telegraphic and telephonic. According to John B. Taltavall's *Telegraphers of To-Day*, he held over 100 patents for everything from synchronous multiplex telegraphy to "anti-page relays." With a name like Pat Delany, one can guess correctly that he was Irish. Delany came to this country when he was nine. He became a proficient press operator by the time he was 18, and went on to become an executive in several telegraph companies before devoting full time to his inventions.

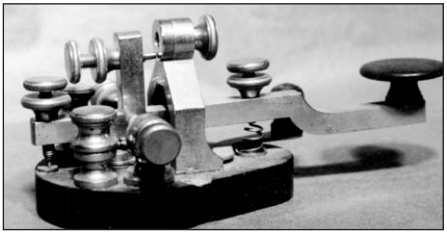
Inevitably, at least one of Delany's projects focused on the development of a better key. The result is pictured here. In fairness to Mr. Delany, the key does what it is supposed to do, but it looks like it may have served as inspiration for a Rube Goldberg invention. The patent award (Letters Patent 232007, Sept. 7, 1880) was based on the ability to readily rotate the face of the anvil, " ... whereby fresh positions of the face of the anvil may be presented to the hammer ... without varying the distance between the point and the anvil ... ."

As with some other contemporaneous inventions, there was a perceived need to facilitate the replacement or cleaning of the electrical contacts which composed the hammer (usually a platinum point mounted on the underside of the lever) and the anvil (which was usually mounted on, but insulated from, the base of the key. By loosening the jam nut on the anvil support, one can rotate the face disk to a "fresh" position without changing the gap which had been set by the operator to his or her satisfaction. Unaddressed is the question of how often one needed to do this. Not often. Conventional key points could be easily cleaned with a fine file, and probably an entire standard key could be replaced for a sum considerably less than the cost of a Delany key.

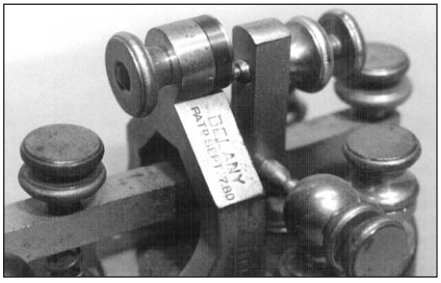
By positioning the anvil above the lever, Delany had to find a new way to install a circuit-closing switch. The conventional arrangement was to provide a lever directly connecting a binding post with a leaf mounted on the anvil. Delany's solution is difficult to see, but circuit closing is accomplished through small wedge mounted under one side of the anvil support. The centrally-mounted circuit closer lever is connected underneath the key base to one side of the line, and makes contact with the wedge when closed, all of which explains why the base is made of hard rubber. And there's a further peculiarity caused by this anvil arrangement. Delany was not satisfied with one-lever support trunnion to provide an electrical path to the lever, so he continued the connection to the lever-return spring as well.

Delany also claimed in his patent application that the positioning of the hammer above the lever would alleviate that old enemy, "operator's

(continued on page 55)



The Delany key is mounted on a hard-rubber base. Metal parts were nickel-plated brass.



The anvil (mounted atop the trademarked support structure) is insulated from the remainder of the key. The hammer is threaded into the right-angle projection above the lever.

AWA Commemorates Two-Way Transatlantic Test

Just two years ago we celebrated the first one-way transmission across the Atlantic ocean with the 1BCG operating event (1). The original message, transmitted in December, 1921, was received in its entirety by Paul Godley, who was listening in a tent located on a coastal moor in Scotland. The great Atlantic had been conquered! However, neither Paul Godley, or anyone else for that matter, was able to send back a message from that "other side." There was still work to be done.

It was not until the fourth and final transatlantic tests in November, 1923, that the first amateur transatlantic two-way communication would take place when Fred Schnell, 1MO, and John Reinartz, 1XAM, (later W4CF and K6BJ, respectively) would work for several hours with 8AB, Leon Deloy, in France (2). Interestingly, John Reinartz later became a good friend of Bruce Kelley's, giving Bruce a spare "bottle" for his 1500T kW phone set, a 2000T that now "hangs" in the AWA annex tube room. Reinartz worked for Eitel-McCullough (Eimac) and produced many articles and "tips" for the amateur builder. (Incidentally, Bruce Kelley's kW phone set is now being restored to operation by Mike Raide, W2ZE.)

In the December, 1921 "tests," 1BCG operated on what was then considered a "short wave" frequency of about 230 meters. 1MO/1XAM worked 8AB on about a 100 meter wave. During that time period wavelengths much below 200 meters were considered a "no man's land." But, indeed, those short waves got the job done and the exodus from the 200 meter region had begun! It should be noted, that the importance and significance of these amateur radio accomplishments are illustrated in the proceedings of the IEEE (3).

It would seem appropriate to celebrate the 75th anniversary of the significant fourth transatlantic test by utilizing similar apparatus operating wavelength. As 1MO was first to contact French 8AB (4), a recreation of the 1MO transmitter seems most appropriate for our special event. In addition, the 1MO transmitter is well-illustrated in the feature *QST* article. The 1XAM receiver also deserves much credit, for it is known from the *QST* article, that at least on one occasion during the fateful night in November, 1XAM was able to copy completely a message from 8AB while 1MO needed several fills. Therefore, our special event station will consist of the 1MO transmitter and 1XAM receiver.

The 1MO transmitter appears to be essentially a fullwave, self-rectified, self-excited set with four 203As in a shunt-fed Hartley circuit. Two sets of two tubes each are used in parallel, with each pair of tubes conducting on each half of the 60 cycle a.c. line frequency. The resulting received signal is a distinctive 120-cycle note that even under adverse band conditions is very effective. Nothing is mentioned about the 1MO antenna system.

The 1XAM receiver consisted of the then new type "spider-web" coil, 201A detector and 201As in the "two-step" audio stages driving a speaker. The particular set we have available for use is of Reinartz design, but utilizes UV199 tubes instead of the 201As. Reinartz also utilized an ingenious combination of transmitter and receiver mating to allow full break-in operation, which is illustrated in a separate article, but in the same *QST* issue (5).

Little was mentioned about Leon Deloy's (French 8AB) apparatus, other than his note being on the order of 25 cycle, raw a.c.. It was also mentioned, in the *QST* article, that he was authorized up to 1KW input and it was assumed he ran close to that power level. His receiver was a Grebe CR-13.

Now, exactly 75 years later, to the day, we shall schedule an event to work other amateurs with this early apparatus, commemorating this momentous occasion. On November 27, 1998, a Friday night, the day after Thanksgiving, using the call W2AN and operating from the AWA annex, on or about 3525 khz, beginning promptly at 6:00 P.M. EST, we will work as many stations as possible. We will resume operation the next

(continued on page 55)

About Our

Feature Article Authors

LARRY BABCOCK
The AWA Bradenton Meet

Larry Babcock grew up in his dad's radio sales and service business, acting as a service tech and installing auto receivers while still in high school. After serving in the Infantry during World War II, he earned a BSEE degree at the University of Iowa and began a 37-year career at Bell aircraft.

At Bell, Larry headed programs to develop radar and air-to-air microwave relay links for the RACAL missile system and, later, to evaluate the Army's military electromagnetic interference problems. During his last years at Bell, Larry was in charge of the design of electromagnetic compatibility (EMC), TEMPEST, ordnance safety, radiation hazards and lighting immunity for all military equipment produced by the company. Later, he worked in these same fields as a consultant for other companies.

Larry began collecting antique radios in about 1973. He specializes in Federal, Wurlitzer, and WW1 aircraft sets, and has written a book on the history of Federal radio. He is on the AWA Board of directors and serves as a guide at the AWA Museum in Bloomfield.

CARLOS ALBERTO FAZANO
The Birth of Semiconductor Electronics

Carlos Fazano holds a degree in chemistry and has published two books on laboratory instrumentation. A lifelong hi-fi, short-wave listening and ham radio enthusiast, he learned electronics by assembling tube radios and audio amplifiers. Despite his busy professional schedule, he has always found time to further his studies in the evolution of electronic technology. Carlos has published several articles in *The Old-Timer's Bulletin*, the *AWA Review* and the English magazine *Radio Bygones*.

M.L. "HUTCH" FREDERICK, WW2A
May Lillian Smith—A Pioneer Amateur Operator

"Hutch" Frederick was born and educated (registered nurse) in Wisconsin. She moved to Rochester, NY when her husband (AWA Director Jim Frederick, K2GBR) joined the legal staff of Eastman Kodak Company in 1953. She was first licensed as K2LJZ in 1955, now holds Extra Class call WW2A, and particularly enjoys working "old timers" on CW. She is a licensed private pilot, active with a local quilting guild, and sometimes helps husband Jim guide tourists through the AWA museum.

WILLIAM L. HOWARD (LTC, RETIRED)
A BBC Monitor Receiver for the Norwegian Resistance

William Howard has been interested in radio since building simple receivers as a cub scout. He has had a long and varied military career, which has included assignments as a Tank-Automotive Maintenance Officer, Commander of a Military History Detachment in France, and Officer In Charge of a field collection team rounding up captured material in Vietnam.

After leaving active duty in 1970, Bill worked in civilian occupations for a few years, remaining active in the Army Reserve. Then, after returning to college and earning a second undergraduate degree (Engineering), he worked as an Ordnance researcher at Batelle Memorial Institute and as Special Assistant to the President of an armaments manufacturing firm. Maintaining his connection with the Army Reserve, he also carried out many key assignments in Military Intelligence.

After retirement, Howard moved to Florida and established a museum to preserve the history of the Army's technical intelligence operations. On occasion, he still teaches technical intelligence courses for the Army and, in 1996, was a nominee for the Military Intelligence Hall of Fame.

PAT LEGGATT
How Radio Became Wireless

Pat Leggatt was born in Devon, England and educated at Marlborough College and Bristol University. Joining the BBC in 1953, he served in several posts until his retirement in 1987. These included Engineer-in-Charge, Television Recording; Head of Studio Planning and Installation; Head of Engineering Information; Chief Engineer, External Relations. He is a former chairman of both the IEEE History of Technology Group and the British Vintage Wireless Society (BVWS), as well as a recipient (1991) of the AWA Taylor Award. Pat's interests include studying and writing about wireless and television history, collecting and restoring vintage radio items, and music from baroque to jazz.

D.K. OWENS
Building A Broadcast-Band Grid Dip Meter

Ken Owens, our long-time Contributing Editor ("Equipment Restoration"), first became in-

terested in electronics and radio as a high school student during World War II. By war's end, his knowledge had progressed to the point where he was able to open a radio repair shop with a friend. They did a brisk business refurbishing war-weary radios which, until civilian production returned to normal, couldn't be easily replaced.

His career as a full-time radio tech ended when he entered college, eventually earning both a B.S. and an M.S. in chemistry. Then it was on to a career as a professional chemist specializing in plastics. Ken pioneered in the development of Mylar, working with manufacturers using the material in such applications as capacitors, videotapes and audiotapes.

He became a serious radio collector in the 1980s, a few years after his retirement, and specializes in 1920s battery broadcast sets. Ken is active in The Central Ohio Antique Radio Association, and frequently gives presentations in radio theory and radio history.

DICK PARKS

The WECO Model 25 Amplifiers

Dick Parks has just joined the *OTB* staff as a Contributing Editor ("Breadboarding"). Born in 1936, he was brought up in Springfield, MA, where his dad worked in the Westinghouse plant that had manufactured the RA-DA sets. The factory junkyards provided him with ample stocks of rejected chassis ripe for parts-picking. After serving in the Navy (1953-1957), he entered University of Maryland and received his BSEE in 1961. Beginning in 1967, he made a career move that led him to become an expert in the identification of aircraft using computerized radar signal processing (an extension of the old military IFF techniques).

In 1981 he became a consultant in this field, working mostly for the Navy and traveling worldwide for data collection and development testing. With the end of the cold war, Dick now finds himself semi-retired, which makes it possible for the *OTB* to draw on his varied talents.

On the personal side, he tells us that he's married and has five grown kids. He plays jazz in four or five bands, doubling on trumpet, trombone, banjo and sometimes bass.

JAMES P. RYBAK

"Forgotten" Pioneers of Wireless

James Rybak was born in Cleveland, Ohio in 1941. He has been interested in both radio and electronics, first as a hobby and then as a profession, for over 40 years. Jim holds B.S., M.S., and Ph.D. degrees in electrical engineering as well as Extra-Class amateur radio license W0KSD. He teaches engineering and mathematics at Mesa State College in Grand Junction, Colorado.

In recent years, Rybak has published numerous articles in the U.S. and abroad on the history of both wireless and electrical technology. When not writing articles, he spends his free time trying to achieve "Worked All States" through the low- earth-orbit amateur radio satellites as well as trying to become knowledgeable about digital photography and slow-scan television.

KEY AND TELEGRAPH, *continued from page 52*

paralysis." Well, maybe, but the fraternity was unmoved. Just as Tillotson was persuaded to market the Phillips' removable-anvil key (*OTB*, August, 1993), it appears that Partrick & Carter of Philadelphia may have fabricated Delany's key although there is no maker's name on it. The adjusting screws are typical, distinctive P&C, and the binding posts match binding posts on some early P&C marked instruments. We've never seen a Delany key advertised in the trade journals or catalogues of the time, and can't recall any existing in collections, so the assumption is that not many were made or sold. Delany did better with some of his other projects.

AWA COMMEMORATES, *continued from page 53*

evening, the 28th, if popular demand dictates. A special QSL card will be available.

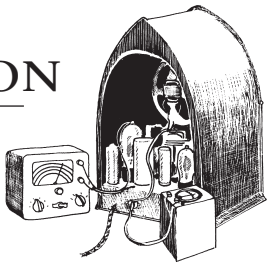
— Bob Raide, W2ZM

REFERENCES:

1. *OTB*, August, November, January 1996; *QST*, November, 1996.
2. *QST*, January 1924, pages 9 through 12.
3. *Proceedings of the IEEE*, Vol 84, No. 12, December 1996, page 1762, refer to footnote 2, page 10.
4. *OTB*, June 1985 "Transmitter for the 1929 QSO Party" by Bob Dennison.
5. *QST*, January 1924, page 26.

EQUIPMENT RESTORATION

EDITED BY **KEN OWENS**, 478 SYCAMORE DR., CIRCLEVILLE, OH 43113
PLEASE SEND CORRESPONDENCE DIRECTLY TO THE ABOVE ADDRESS,
INCLUDING SASE FOR REPLY.



Haunted By Mistakes of the Past?

Anyone who restores radios will eventually encounter one which has been repaired in the past. Workmanship can range from expert to incompetent to downright dangerous. It is imperative to check past repairs carefully for mistakes and safety.

Repairs may be electrically correct, but sloppy. You may find replacement parts dangling loose under the chassis and joints wrapped with friction tape. I always correct such "repairs," even if they are perfectly functional, because they offend my sense of good workmanship. Insulated solder lugs are great for anchoring loose parts. You can almost always find a bolt to mount the lug to.

Of course, not all repairs are electrically correct. Let's look at some mistakes I have found. The push-pull (P-P) amplifier seems to invite wiring errors. The essentials of the circuit are shown in Fig. 1. The circuit was popular in large radios because it gives 5-6 times the power output of a single tube. The signal is fed to the output tubes through an interstage transformer with a center tapped secondary. The voltages at each grid are 180º out of phase so that one grid is going less negative while the other is going more negative. At the plates, current through one half of the output transformer increases while decreasing in the other half. This "push-pull" action gives the circuit its name.

While restoring a 1934 General Electric Model M-81, I observed that the audio interstage transformer had been replaced long ago. After the set was up and running, the sound was weak for no apparent reason. The resistance from each grid to the center tap should be equal, but in this set, one reading was twice the other. Inspection showed that the interstage secondary was wired like Fig. 2. Since the signals at each grid are no longer 180º out of phase, there is some signal cancellation. I swapped the wires around, and the set will now blow you out of the room. Why did the previous owner put up with this poor performance?

The example in Fig. 3 was found in a 1934 Philco Model 16X console. The symptoms were the same as above. The output transformer was a replacement. The resistance from each plate to B+ should be equal, but one was twice the other. Inspection showed that it had been wired as shown. Swapping two wires restored performance.

Sometimes you find deliberate circuit changes. In a Zenith Model 12S 58, I noticed that the interstage transformer and some parts around the output tubes had been replaced. I checked the circuit and found it wired like Fig. 4. The repairman evidently didn't have a P-P transformer to replace the original, so he committed this crime. He used a single-ended transformer and coupled the bottom tube to the top one through capacitor, C. He provided no DC grid return for the bottom tube, so it will eventually cut off from accumulated electrons on the grid. The result is a single-ended amplifier trying to operate under P-P conditions. If the tube doesn't cut off, the grids are in phase, so there will be considerable signal

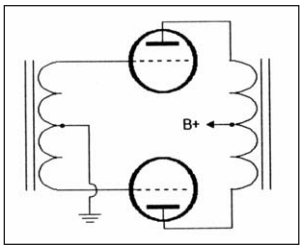


Figure 1.

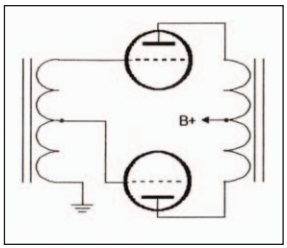


Figure 2.

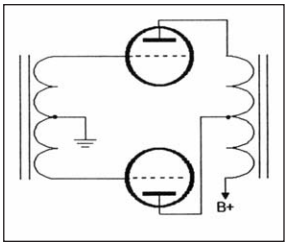


Figure 3.

cancellation.

I played the set briefly before fixing it. The sound was weak and mushy as expected. Capacitor C, was leaky so the bottom tube never completely cut off. With the correct transformer, the radio sounded great.

The next mistake, found in a 1931 Philco Model 70, is more subtle. After replacing bad components, the power supply check showed all voltages correct except the bias on the Type 47 output tube. There was zero voltage between grid and filament of the tube, yet the bias voltage at the bleeder resistor was -18V and there was -18V from grid to chassis ground. From the tube's viewpoint, there was no bias, but the voltage was there! The set played, but sounded bad.

I could tell from the appearance of the wiring that the power transformer had been replaced years ago with the correct Philco part. Operating voltages are derived from the circuit of Fig. 5. The bleeder resistor, Ra-Rd, is a large 4-section unit with 6 lugs. It is divided in the middle for the wirewound volume control which forms part of the bleeder. Bias voltage is developed across Rd in series with the high voltage center tap and ground. The 47 tube has its own separate filament winding with its center tap connected to the grounded lug of the bleeder. The rest of the tubes are heated by another filament winding with its center tap connected to the bias line for reasons which escape me.

Resistance measurements and circuit checking revealed that the center taps had been reversed when the transformer was replaced. The actual connections were as shown by the dotted lines in Fig. 5. Connected this way, the output tube's filament and grid return go to the *same point*. Although the bias voltage is there, the tube only sees the difference between its filament and grid — zero in this case.

Some inept repairs can be potentially lethal. A friend asked me to look at a 10-tube Zenith console which operated well, but had a loud hum. Inspection showed that someone had recently replaced the filter capacitors with modern units, but the original capacitor was still partially wired into the circuit. It was a 2-section, metal-can unit mounted on an insulating wafer. Insulation was necessary because the high voltage center tap was returned to ground through a small resistor, R, to generate a couple of negative volts for the AVC circuit, and this voltage appears on the can. The diagram is shown in Fig. 6.

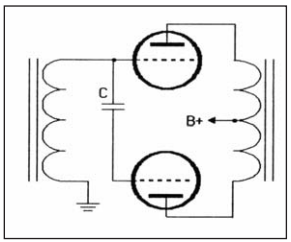


Figure 4.

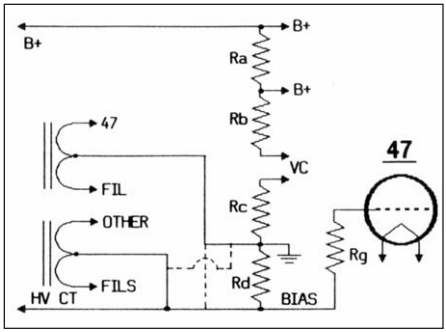


Figure 5.

The original capacitor (which had one shorted section) had been removed from the circuit by disconnecting the negative lead to the can at point "X", leaving the positive leads connected. This cured the short on the power supply, but created 2 other problems — one deadly!

With the negative lead removed, the good section in series with the shorted section bypassed the a.c. ripple in the B+ around the field coil and on into the radio. This defeated the filtering action of the field coil and caused the hum. More serious was the fact that disconnecting the negative lead allowed the can to float so that the full B+ voltage (310V) appeared on the bare can through the shorted section. Anyone touching the can and chassis while the set was operating could have been killed!

It's desirable to leave original can capacitors in place to preserve appearances, but *NEVER leave any part of the old capacitor connected*.

The last error was found in a Stewart-Warner R-110 chassis. This is a nice 10-tube receiver with dual speakers. The power transformer had been replaced in the past. Workmanship was good, but all capacitors were original. I replaced the filter and audio coupling caps and fired the set up. Performance was excellent except the sound was highly distorted.

Voltage measurements showed everything correct except for a very high AVC voltage (16V) on a strong station I use for testing. I connected an audio generator to the grid of the first audio tube and noted that the sound was excellent — no distortion. The detector-first audio-AVC circuit is shown in Fig. 7. It is typical, using a Type 55 tube with the volume control (VC) serving as the diode load resistor. The unusually high AVC

(continued on page 64)

REVIEWS: WHAT'S NEW IN PRINT

EDITED BY **WILLIAM E. DENK, W3IGU**, 81 STEEPLECHASE RD., DEVON, PA 19333-1226
PLEASE INCLUDE SASE FOR REPLY.

Electronic Genie —
The Tangled History of Silicon
By Frederick Seitz & Norman G. Einspruch. Published 1998 by University of Illinois Press, Urbana and Chicago, IL. 281 pages, 6 ¼ by 9 ¼ inches, hardcover. List price $35.00.

In the words of the Preface, this book "covers developments from the time of Lavoisier, who first predicted the existence of silicon as an element, to the present time, when that element has become a revolutionary agent in the conduct of everyday affairs as well as in the technological world." While providing a thorough treatment of semiconductor theory, transistors, and integrated circuits, *OTB* readers will be pleased to learn that the authors also provide a superb history of the art, including the significance of galena, germanium and silicon in early wireless and radar (some 160 pages). Radar is dealt with in separate chapters dealing individually with developments in Great Britain, Germany, France, Russia, Japan, and the United States. In radar, the tungsten-silicon diode was central to the equipment's heterodyne mixer at the very high frequencies involved.

The history of the development of the discrete transistor is dealt with in several chapters centered on Bell Labs, William Shockley, Walter Brattain and John Bardeen.

The authors trace the push for extreme miniaturization to such developments as the proximity fuse of World War II, and hearing aids. They observe that once the discrete transistor became a standard member of the electronics family, it was inevitable that it would become involved in advances in integration of the systems in which it was employed. The pioneers in the development of the integrated circuit (microelectronics) are identified as Jack S. Kilby of Texas Instruments, and Robert N. Noyce at Fairchild Semiconductor. Their product was a semiconductor substrate, with engraved transistors, resistors, capacitors and interconnects forming a complete integrated circuit — essentially all components being fabricated from a wafer of germanium or silicon.

Although the use of semiconductors was common in radio long before DeForest invented his Audion, it is easy to understand why vacuum tube technology preceded modern semiconductor technology by so many decades. In contrast, the theory underlying vacuum tube technology seems so obvious, while to this reviewer, with his 1930s engineering education, the technology underlying semiconductor devices seems complex indeed. But, believe me, this book will help you understand and appreciate it.

♦ ♦ ♦ ♦

Experimental Science
By George M. Hopkins. First published 1890. Present publisher: Lindsay Publications, Inc., P.O. Box 558, Bradley, IL 60915-0012. 5½ by 8½ inches. 531 pages, Vol. One; 538 pages, Vol. Two. Paperback $34.95, hardcover $49.55 (for the two-volume set).

Lindsay has dug up another interesting old publication that should interest many of us who are technically inclined. The printing chosen for resurrection is the twenty-fifth Edition (it must have been popular!) published in 1902 and 1906. The author's first preface is dated 1890, so this is really an antique! Lindsay tells us that Hopkins wrote a column for amateur scientists for *The Scientific American* in the late 1800s. You won't find "radio" in the index, but you will find four entries under "wireless."

While these volumes will give you a good understanding of the status of physics around the turn of the century, they were not intended to be a physics text-book. Rather, important physical principles are presented by way of nicely illustrated experiments that the reader can duplicate, or that can be easily understood from the many illustrations.

For example, Volume One describes the construction of a very simple phonograph, the making of various wet and dry cell batteries, and "Foucault's Experiment" in which a spinning copper disc is rapidly braked to a stop in a strong magnetic field.

Other areas covered include: properties at rest and in motion; force; the gyroscope; falling bodies; molecular actions; liquids; gases; sound; tops; heat; light; microscopy; the telescope; magnetism; electricity; electric motors; electric lighting; induction; the telephone; projection;

mechanical operations; and a lengthy appendix (360+ pages) where you'll find such ultra-modern subjects as Professor Pupin's loading coils for long-distance land-line telephony, and wireless telegraphy.

♦ ♦ ♦ ♦

Manipulating The Ether — The Power Of Broadcast Radio In Thirties America

By Robert J. Brown. Published 1998 by McFarland & Co., Inc., Box 611, Jefferson, NC 28640. 6 by 9 inches, 310 pages. Cloth $49.00 postpaid.

The author, who is pursuing a doctoral degree in history at Syracuse University, has accurately titled this fine book. But if he had stopped precisely midway through, it could have been titled "The Four Presidential campaigns and Terms of FDR." Your reviewer found that part of the book fascinating; yet, as a life-long Republican, it was painful to re-live the defeats of President Hoover, Alf Landon, Wendell Willke, and Thomas Dewey. And while it may be that FDR proved to be the better man for the times in which he served (the Great Depression and World War II), he clearly bested his opponents through his masterful manipulation of the air waves.

The author credits FDR as having abandoned bombast and as being the oratorical model of the twentieth century. In contrast to the 175 to 200 words per minute spoken by most radio orators, FDR spoke at a much slower 120 wpm. His announcement of the attack on Pearl Harbor was delivered at 88 wpm! A study is quoted as having found that about 75% of the vocabulary used in Roosevelt's "fireside chats" consisted of the "1000 most common words in the English language." But the author's New York background is revealed when he credits FDR with having an "All-American voice" which was "far more acceptable to the broad reach of Americans." In the midwest and elsewhere we made fun of FDR's "Hahvud" accent. Still he easily bested Hoover, whose "unease before the mike stemmed from his awareness that his monotone…had a 'soporific effect on his listeners'."

In his 1940 campaign against Willke, with war in Europe a year old, and with a strong non-interventionist tide running in the U.S., FDR assured his listeners "…I shall say it again and again. Your boys are not going to be sent into any foreign wars." The electoral vote: FDR 449; Willke 82.

FDR's first real competition came in 1944 when he was opposed by Dewey, who was considered FDR's speaking equal. Yet, in spite of the "fourth term question" and his ill health, FDR received 25,602,505 votes to Dewey's 22,006,275 (electoral vote: 432 to 99).

Author Brown leads us back through the banking crisis and the Great Depression (one out of every four were jobless in 1933). It was here that radio's "fireside chats" became so significant and cemented the bond between FDR and the people. With the resultant public support, FDR was able to count on the congress to give him most of what he wanted. He did, however, fail in his plan to "pack the Supreme Court" to ensure the Court's support of some of the New Deal's most radical reforms.

On May 26, 1940, with the French Army nearing defeat and Great Britain fleeing the continent, FDR, in a fireside chat, prepared the American people for an "expanded commitment to the British," and on July 18 imposed the first peacetime draft in our history. The Lend-Lease program was put into effect on December 17. FDR made his famous "Arsenal of Democracy" broadcast of December 29, 1940, to persuade listeners of the necessity of granting him power to "sell, transfer title, exchange, lease, lend, or otherwise dispose of" articles of war to any nation deemed central to American security.

As a result of FDR's thorough preparation of the public for war, an October 5, 1940 poll revealed that 70% of Americans felt that it was more important to defeat the Axis than to stay out of war. The diminishing resistance of the isolationists (such as Senators Taft, Vandenburg and Nye, and aviation hero Charles Lindbergh) is dealt with fully. Author Brown cites evidence indicating that broadcast stations refused requests by Lindbergh and others for air time in which to explain their views.

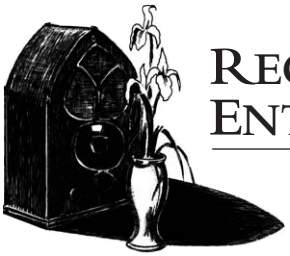
On December 7, 1941, with the attack on Pearl Harbor, isolationism died and the nation was united. The book takes the reader on through the ultimate allied victory, but on the way covers such topics as the explosion of the Zeppelin Hindenburg at Lakehurst, New Jersey, the very popular news program "March of Time," the abdication of King Edward VIII, and finally Orson Welles and his "War of the Worlds," the introduction of which is presented verbatim!

While this is history viewed through the perspective of radio, it is important history, interestingly presented. We can all profit from experiencing the book's recreation of those significant decades of our lives, and radio's part in it.

♦ ♦ ♦ ♦

The following item was received at the OTB *editorial office and, since deadline time was near and the material was time-sensitive, it was*

(continued on page 64)



Recent Radio, TV and Entertainer Obituaries

COMPILED BY **CHARLES S. GRIFFEN W1GYR**
1225 NEW BRITAIN AVE., WEST HARTFORD, CT 06110-2405

Note: When known, the date of death is indicated in parenthesis.

LLOYD BRIDGES, 85, (3-10-98) actor. He began his career on stage and appeared in several well-known films in the 1940s and 1950s, including *Here Comes Mr. Jordan, High Noon, Home of the Brave* and others. In the 1980s he was seen in *Airplane, Airplane II* and *Hot Shots.* Bridges starred in such TV series as *Sea Hunt* (1957-1961), *The Lloyd Bridges Show* (1962-1963), *The Loner* (1965-1966), *San Francisco International Airport* (1970-1971), and *Joe Forrester* (1975-1976).

ALICE FAYE, 83, (5-9-98) actress. She began her career doing chorus work in the 1931 edition of *George White's Scandals.* One of its stars, Rudy Vallee, got her a singing part and featured her on his radio show. Faye starred in many 20th Century Fox musicals during the 1930s and 1940s — *Sing Baby Sing, In Old Chicago, Alexander's Ragtime Band, Tin Pan Alley* and others. After WWII she was mainly active in radio starring with her bandleader husband, Phil Harris, on the *Alice Faye-Phil Harris Show.*

FRED W. FRIENDLY, 82, (3-3-89) broadcast journalist. Friendly produced some of Edward R. Murrow's best and most influential television documentaries on *CBS' See It Now* from 1951-1958 and on *CBS Reports* in the 1960s. He was President of CBS News from 1964-1966. This was followed by a teaching career at the Graduate School of Journalism at Columbia University from 1966-1990.

DR. JOHN V. GRANGER, 79, (12-1-97) engineer. During WW II he served as a member of Harvard's Radio Research Laboratory in England. He moved to California in 1949 to join the Stanford Research Institute (SRI) as Director of their Antenna Laboratories. In 1956 he left SRI to found Granger Associates in Palo Alto, CA. Here Granger developed a device to keep lightning from striking airplanes. He served as President of the IEEE in 1970.

TAYLOR GRANT, 85, (2-24-98) broadcast journalist. He began his career on Philadelphia radio stations and then moved to New York City. Grant spent ten years with ABC and the Mutual Radio Network. He was associated with ABC's *Sunday Evening News With Taylor Grant* and *Headline Edition.* He returned to Philadelphia where he broadcast on several radio and TV stations until his retirement in 1972.

PETER LIND HAYES, 82, (4-21-98) entertainer. He worked in nightclubs, hotels, acted in films but it was in television and radio that he gained the widest popularity. Hayes starred in the TV series *The Peter Lind Hayes Show* on NBC in 1950 and 1951 and *Peter Loves Mary* on NBC in 1960 and 1961. During the 1960s he and his wife, Mary Healy, hosted a daily program on WOR(AM) in New York City. They were also regular substitute hosts for Arthur Godfrey on his television show in the 1950s.

JACK R. HOWARD, 87, (3-22-98) broadcasting executive. He was Chairman of Scripps Howard newspaper's broadcasting division for 39 years. Howard began his career on the newspaper side of the business, but in 1936 joined the staff of KNOX(AM) Knoxville, TN to learn about broadcasting. Later he moved to New York City to manage the firm's developing radio division. Howard expanded the division from two radio stations in 1937 to six television stations and three radio stations at the time of his retirement in 1976.

ALEXANDER ANDERSON McKENZIE, II, 89, (12-13-97) radio engineer. In 1932 he was hired as a radio man for the establishment of a weather observatory atop Mt. Washington, NH. This was a part of the International Polar Year series of observations. Later he worked for the Yankee Network as the resident engineer at their transmitters, first on Mount Washington and later in Paxton, MA. During WW II he worked at MIT's Radiation Laboratory on the development of LORAN. McKenzie was the supervisor of the installation of LORAN transmitters in Labrador, Newfoundland, Nova Scotia, Bermuda and Trinidad between 1942 and 1945. After the war he worked in New York City as an editor and au-

thor of technical publications dealing with radio and electronics.

THOMAS F. O'NEIL, 82, (3-14-98) former Chairman/CEO of the RKO General station group. He joined the family business, General Tire & Rubber, in 1937. After WW II he became interested in broadcasting and joined the Yankee Network as VP and Director. In 1948 he oversaw the creation of General Teleradio which merged Yankee's radio affiliates with WNAC(TV) in Boston. In 1951 the Don Lee Broadcasting System (four AMs, one FM, one TV and 19% of the Mutual Broadcasting System) was purchased. This was followed by the acquisition of RKO Radio Pictures from Howard Hughes in 1954. The new company was called RKO General. O'Neil retired from the firm in 1985.

ROY ROWAN, 78, (5-10-98) radio and TV announcer. Rowan began announcing at WKZO(AM) Kalamazoo. This was followed by moves to stations in larger markets before joining CBS Radio and later CBS Television. For 23 years he was the announcer and pre-show warmup man for the the Lucy shows — *I Love Lucy, The Lucy-Desi Comedy Hour, The Lucy Show,* and *Here's Lucy.* Other announcing credits include *People Are Funny* with Art Linkletter and *Gunsmoke* on radio and *I Married Joan, Rawhide, Simon and Simon,* etc. on TV.

FRANCIS ALBERT (FRANK) SINATRA, 82, (5-14-89) vocalist and actor. Sinatra began his professional career with the Harry James Band in 1939. In 1940 he joined the Tommy Dorsey Orchestra and sang with the Pied Pipers, but in 1943 he started a career as a single and soon became an international name as movie, record and television star. He made numerous guest appearances on radio and worked for CBS Radio on *Your Hit Parade* and *Songs by Sinatra.* Sinatra was seen on television on CBS's *The Frank Sinatra Show* (1950-1952), ABC's *The Frank Sinatra Show* (1957-1958) and as a guest star on variety, game and dramatic shows. He appeared in 58 movies, winning an Oscar for his performance as Maggio in *From Here to Eternity* in 1953.

CARL E. SMITH, 91, (5-2-98) broadcast engineer. After founding the Cleveland Institute of Electronics, a correspondence school, he engineered the Navy's low frequency, 2 million watt radio station in Cutler, ME. The facility made it possible to communicate with submerged submarines in the North Atlantic. Smith worked for WHK(AM) in Cleveland for more than 25 years. He left the station as VP in charge of Engineering to start Carl E. Smith Consulting Radio Engineers and later Carl E. Smith Electronics.

EDWARD THORGERSON, 95, (n.d.) radio announcer. He was a sports and news announcer in the early days of radio and later became a familiar voice to moviegoers as the newsreel announcer for Fox Movietone News. Thorgerson began his career with NBC in 1927. Later he was employed by CBS and was a news commentator for Dumont Television in New York City. He retired in 1959.

KARL RINNER WENDT, 91, (8-19-97) engineer. He worked for RCA in the 1930s and 1940s and for Sylvania Corp., Wendt-Squires, Inc., Paramount Pictures, Rand Corp., Martin Marietta, Colorado Research Corp., and Data Ray Corp. Wendt held 46 patents including one for automatic frequency control.

HENNY YOUNGMAN, 92, (2-23-98) comedian. With his band, the Syncopators, he played the Jewish resorts in the Catskills during the 1920s. Later he began an act of his own and in 1936 was hired by Kate Smith to appear on her CBS radio show. Youngman also appeared on TV in *Rowan & Martin's Laugh-In, Hee Haw, Hollywood Squares,* and *The Tonight Show.* He was also a frequent performer at nightclubs, sales meetings, trade shows and other events.

Information for this column was obtained from *The Big Bands, The Boston Globe, Broadcasting and Cable, The Complete Directory of Prime Time Network TV Shows 1946-Present (4th ed.), The Encyclopedia of Jazz, The Hartford Courant, The New York Times* and *Variety.*

Thanks to Alex McKenzie, III; Frank Q. Newton, Jr. W6SYG; Edwin C. Tyrrell, Jr. and Richard Waddell for additional source material.

BUSINESS CARD ADS, *continued from page 65*

Send us a copy of your business card, or a special typeset ad designed to fit our standard space. We can, alternatively, typeset a short message for you (no more than eight lines, 50 characters max per line, please). For the time being, there will be no charge for typesetting. All ads must be for radio-related items or services and must be paid in advance. Send your ads and checks (payable to AWA) to Kevin Carey, Advertising Manager, *OTB*, P.O. Box 56, West Bloomfield, NY 14585. Closing date is six weeks prior to first day of month of issue.

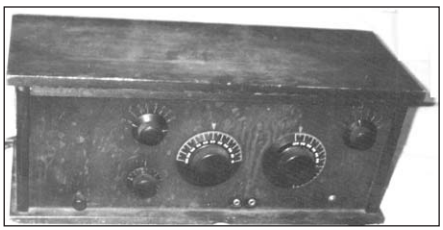
BY: LTC WILLIAM L. HOWARD

A BBC Monitor Receiver for the Norwegian Resistance

In September, 1939, the Germans invaded Poland and World War II began. Within days, Britain and France declared war on Germany. British troops moved onto the continent of Europe and took up positions with the French. Along with all the other preparations for war, Prime Minister Winston Churchill created the "Special Operations Executive." The SOE was charged with the mission of "Setting Europe Ablaze." The existing Secret Intelligence Service, or SIS retained its mission of gathering intelligence. Agents operating behind the lines would provide the necessary information and coordinate activities of the resistance movements.

In preparation for the invasion of the territory of France and the low countries of Belgium, Luxembourg and Holland, the Germans moved to secure Norway and Denmark. Norway was occupied on 9 April 1940, and the Norwegian Resistance was born. In May, 1940, the Germans invaded France, and in a matter of weeks overran the British and French Forces. The British evacuated their forces from Dunkirk and began planning for the eventual return to the continent. Most of the overrun countries established governments in exile in London.

At the beginning of 1941, various resistance groups in Norway were brought into an organization named MILORG. This was created to support a possible allied invasion from the west to liberate Norway and to establish law and order in the event of a German collapse. MILORG also conducted sabotage operations, most notably against the heavy water plant at Rujukan, which delayed the development of the Nazi atomic bomb.



Tickler control is at lower left; filament rheostat to the right of it; "key plug" on-off switch at lower right. Large knobs and smaller knobs above them are tuning controls and their associated coil tap switches. Dual headset jacks below and between tuning controls.

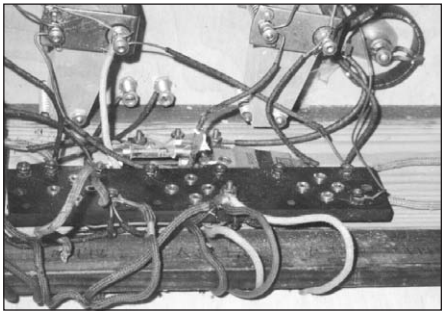
MILORG was under the command of the Norwegian Military in London, and was joined to the SOE. It is reported that the organization had approximately 40,000 men under arms. But before the British could begin supplying these forces with arms and equipment, it was necessary to establish radio communication with them. The major burden of communication was placed on the British Type 3 Mark II, also referred to as the "B 2" set (This set was discussed in one of the 1995 issues of *Electric Radio*).

The "B2" sets provided the main communication link to the base station in England. They were assigned to areas known as *districts*. But each district also had to maintain communication with its outlying areas. Procurement of radios for this purpose was a top priority for MILORG. The man who supplied MILORG with the equipment was Salve Staubo, founder of Hovding Radiofabrikk in Oslo. The production of these sets has been covered in the article "The Story of 'OLGA' Illegal Norwegian Transmitter-Receiver" in *Radio Bygones*, Oct/Nov 1991.

Less well known and discussed are the "home-brew" sets made by the Norwegians from components air dropped from England. These sets were designed so the resistance could monitor BBC and listen for coded messages. Though crude, they were quite effective. They were also, I suppose, considered more expendable than the OLGA or the B2 sets. If one of these were captured by the Germans, another could quickly be made.

I was fortunate enough to be loaned one of these sets by LTC Kevin Cunningham, currently stationed at the Pentagon. At first glance it appeared to be a typical home-brew radio of the 1920s. Looking inside, I saw that most of the

AUTHOR'S ADDRESS: 219 HARBORVIEW LANE, LARGO, FL 33770



Contacts on custom tube socket panel (lower part of picture) were pre-wired to individual binding posts.

components were taken from 1920s and 1930s stocks**.** Interestingly enough, all the components had binding post terminals so that they could be assembled without the use of a soldering iron! The tubes were mounted on a custom bakelite panel drilled to accept individual contacts for each pin. Each contact was pre-wired to a screw binding post.

After tracing the circuit, I found that it was a fairly conventional three-stage regenerative receiver incorporating an audio amplifier (Phillips B443), a regenerative detector (Phillips B409), and an r.f. amplifier. The latter tube was broken in transit, so type is unknown. It may have been a transmitting type pressed into receiver service, as the plate connection was made to a top cap (normally the grid in a receiving tube).

The other components in the set were two variable capacitors, two rotary switches, two fixed capacitors, a resistor in a glass fuse type holder, two tuning coils which were identified as Rheinartz type, and a smaller tickler coil that had a hinge so it could be moved back and forth in relation to the coil in the detector circuit. The final manufactured items were a wire wound rheostat for filament control and various jacks and sockets.

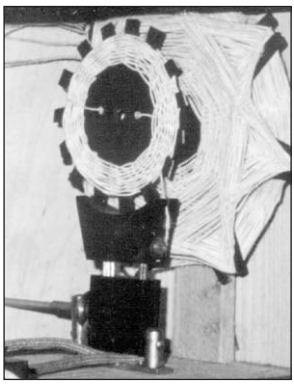
At first I wondered why the designers bothered to put in an r.f. stage. As was pointed out in the 1933 *Radio Amateur's Handbook*, a regenerative detector followed by one or two stages of amplification would bring in CW and phone signals from all over the world**.** Then I realized that there must have been concern about German radio direction finders picking up the signal generated by the detector and re-radiated out the antenna. Adding an r.f. amplification stage not only attenuated this re-radiation, but also solved some other problems — making the receiver more sensitive, selective and stable.

The receiver components were all either equipped with screw terminals or supplied with pre-attached leads. They were no doubt packaged as a kit, with the builder supplying the cabinet. Thus, if desired, the set could be packaged in some way that would disguise its true function. However this particular set looks like a conventional radio.

One pair of front-panel jacks, marked "Hoitaler," was a match for the plug on a set of German earphones I had on hand. There was another jack-like socket which was too small for any plug I had ever seen. Tracing the connections, I discovered that this jack was wired in series with the filament circuit. It must have accepted a metal pin which, when inserted, completed the circuit and turned the set on. It could have been fitted with a simple pull ring to allow a quick disconnect in case of trouble. And removing it from the set would prevent the radio from being turned on by an unauthorized user.

I decided to see if I could make the set operational. Instead of risking the Phillips tubes, I decided to use American type 30 tubes throughout. I improvised a tube socket panel to hold the 30s as well as a socket for the set's power plug (which also carried the antenna and ground connections). Series-wired 9-volt transistor batteries provided 27 volts for the detector plate and 90 volts for the r.f. and a.f. amplifier plates. The 1.5-volt filament supplies came from a group of "D" cells. Using a forest of jumpers, I hooked up the connections on my replacement tube panel to the matching ones on the original panel and also attached the batteries.

I finally managed to get the detector stage working. At least I could here atmospheric noise. However, I was not able to tune in a station. I was not that surprised as there are only two local stations powerful enough to be picked up in this area, and they shut down at sunset! I was going to try again in the morning when I received a phone call from an expert on 1920 vintage sets to whom I'd sent photographs, drawings and a



Reinartz-style detector coil with tickler on movable hinge. Note shaft (at bottom of tickler assembly) for front panel control.

schematic of the set.

His first comment was that the coils looked like long wave units, common in Europe but almost useless in the U.S. He mentioned that there were a couple of LW aviation beacons in my area and, with a really good outside antenna, I might also be able to pick up submarine teletype signals. Before proceeding further, I had a local ham operator with a long wave receiver monitor the bands during a 24 hour period. When he reported that "long wave" was dead, I gave up further efforts to get the set operational.

One-way communications (such as would have been coded into BBC broadcasts) would almost certainly have to be conducted on the long-wave European broadcast bands. Short waves were used for two-way communications. For example, the OLGA sets covered 3.5 to 16 MHz and the British "B2" had a range of 3 to 16 MHz.

This set, while not as esoteric as the B2 or the Norwegian OLGA, still deserves a place in the history of the Norwegian resistance during World War II. I would welcome communications from anyone who can add to my knowledge of this subject. Contact me at the address on the first page of this article or e-mail me at wlhoward@gte.net.

EQUIPMENT RESTORATION, *continued from page 57*

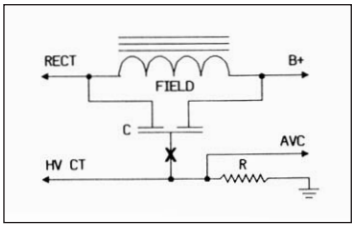


Figure 6.

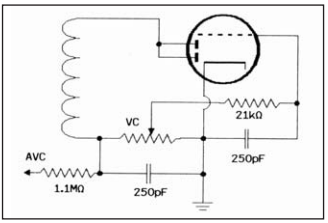


Figure 7.

voltage bothered me because most sets are hard put to develop 7V on the test station.

I checked all the parts in the circuit and found that the volume control measured 7 megohms! It is supposed to be 500 kΩ.

This control was a replacement also. There was no value marked on it, but despite its high value, it didn't appear to be defective. When I replaced it with the correct value, the distortion disappeared, and the set sounded fine.

The 7 MΩ volume control provided virtually no load for the diode detector and allowed the AVC voltage to soar, driving the controlled tubes closer to cutoff. I assume that this 7 MΩ control was the only one the serviceman had which met the physical requirements, so he used it. I can't imagine how the owner tolerated the distortion.

Always check the work of long-gone repairmen and don't be surprised at anything you find. —DKO

WANTED!

Mysterious Tube Problems

I would like to invite the readers to send me their experiences with mysterious problems which were eventually traced to otherwise "good" tubes. When I get enough material, I will do a column devoted to strange and baffling tube problems.

REVIEWS, *continued from page 59*

reviewed on the spot instead of being forwarded to Bill Denk for his comments. However, anyone wishing to submit books or literature for review should send the items directly to Bill. All materials are eventually sent to the permanent AWA library (maintained at our museum) and become part of the collection there. —MFE

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(continued on page 61)

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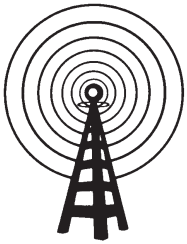

CLASSIFIED ADS

Old-time ads are free to members collecting and restoring equipment for personal use. Please observe the following: (1) one ad per issue per member; (2) include as SASE if acknowledgement is desired; (3) material must be more than 25 years old and related to electronic communications; (4) give your full name, address and zip code; (5) repeats require another notice (we are not organized to repeat automatically); (6) the AWA is not responsible for any transaction; (7) we retain the right to reduce an ad's size if over seven lines; (8) AWA does not accept commercial advertising in this column; and (9) the deadline for ads in the August issue is June 15, 19987. Ads received after that time will be held for the following issue. Mail all ads to:

RICHARD RANSLEY, P.O. BOX 41, SODUS, NY 14551

SELL/TRADE—BC/SW TUBE RADIOS

Spartan Restorers! Picked up curbside just ahead of the garbage truck: disreputable but reasonably complete Equasonne junk chassis with equally disreputable speaker. May be from model 490 console. Can bring to Elgin or Rochester. Marc Ellis, P.O. Box 1306, Evanston, IL 60204-1306; ellis@interaccess.com; (847) 869-5016.

SELL/TRADE COMMUNICATIONS GEAR

Hallicrafters SX-111 with R-46 speaker; Heathkit Apache TX-1. Tom Haymond, W8CCN, Rt. 7, P.O. Box 507, Fairmont, WV (304) 363-7147

National receiver Model HRO-500, with LF-10 preselector which cost over $6000 when new, $895.; Hammarlund receiver Model HQ-110, with matching speaker, $135. Both units look and work great. Pickup or you ship. Irv Sanders, 242 Hunter Lane, Harrisburg, PA 17112-8922 (717) 469-2185 with best time Wed. 7PM to 8PM. E-mail: irvk3iuh@ juno.com

Eico 720 transmitter, $125.; Eico 730 Mod. $125.; HRO 60 and coils, $400.; Howard 490 receiver, $200.; Johnson mobile xmtr, $125. Want PE-73 dynamotor or any other 1000 v., 500 ma dynamotor. Greg Richardson, WA8JPC, P.O. Box 405, Gallipolis Ferry, WV 25515

SELL/TRADE—GENERAL

A very large life-long radio collection of museum quality will be auctioned in late October or early November in the Philadelphia, PA area. For exact date, times, auction catalog, location and inventory listing check the auction web page: http://www. eht.com/oldradio/auction. By e-mail contact: oldradio@worldnet.att.net. By U.S. mail, send SASE to: John Dilks, K2TQN, Estate Sale Coordinator 125 Warf Road, Egg Harbor Twp., NJ 08234-8501. Items of interest include: early Wireless gear; early shipboard receivers and transmitters; early broadcast radio Receivers; tube Collection including a DeForest Winged Audion and almost every early American transmitting and receiving tube manufactured between 1916 and 1960; Morse telegraph Sounders and keys; large selection of "bugs"; microphone collection including many classic broadcast and studio mikes; ham receivers including every RCA model ever made; paper collection including hundreds of early books and an almost 100% complete QST collection, etc. Check the web page often for an updated catalog.

Jenkins mechanical TV scanning unit, Model 100. Includes neon, drive motor, disc, magnifier. Label reads "Jenkins Radiovisor Model 100" engraved into base of unit. Best offer over $3000. Call (516) 734-5063 after August 27. Richard Brewster, 145 Little Peconic Bay Rd., Cutchogue, NY 11935

Buick "Sonomatic" auto radio, Model 980620, circa 1938, $65.; AK-99 parts set, $25.; Emerson U4B, brown bakelite, excellent condition, $110.; RCA 100-A speaker, $35. Jim Ligouri, 7 Sycamore Court, Atkinson, NH 03811 (603) 362-5712 E-mail: Jjligouri@aol.com

Crosley Cincinnati Model IV amplifier, $100.; Air Queen Tombstone, $60.; Crosley 51, $125.; Zenith Pop-up, $50.; Detrola Peewee, $500.; Philco 118B cathedral, $350.; Winston two transistor radio, $150.; Kadette 60THIC Plaskon cabinet, $300.; Shure Model S-36 desk microphone, $50.; Motorola service manual 1928-1942, $35.; National 1 inch oscilloscope, $125.; Jensen 15" speaker, $75.; old phono cartridges, $1. each. Send SASE for 4 page listing of large literature and radio collection. Bill Rolf, 30131 Center Ridge, Westlake, OH 44145 (440) 871-4547

Freed-Eisemann 50, $120.; Zenith 33X with speaker & stand, needs power pack, $150.; pair of Transoceanics (8G005YT, 5G40), $150 for both; AK30 in beautiful Pooley cabinet, $350.; Philco 48-482, $50; RCA Tube Tester, WT-110A, $80.; Superior Tube Tester, TV-11, $80.; Rider Manuals Vols. I-XII, $600. Prefer cash and carry. Ralph Weaver, 3014 Ferguson Valley Road, McVeytown, PA 17051 (717) 899-5622

Catalog #7 now available. Listing of over 13,000 parts, tubes and literature. $6. ppd. Gary Schneider, 9511-23 Sunrise Blvd. Cleveland, OH 44133 (216) 251-3714

Felix the cat jointed doll, circa 1923. This doll was used as a TV test pattern in the 1920s by NBC. Want

Motorola 7" TV set, Model 7VT1, Chassis TS18. Charles Harper, 2000 Jackstown Road, Paris, KY 40361-9344 (606) 484-9393

I.C. Master, 4 " thick 1980; also 1982 Vol. 1 and 2, new mint; Navy WWII 24 hour clock, 8 days, jeweled, Seth Thomas; Barzilay 80E 8 ft. Stereo cabinet, 3 pieces, tambour doors, 15" Altec reflex speakers, oiled walnut; H.H. Scott 296 laboratory stereo dynaural amplifier, four 5881 outputs; Fisher FM-200B tuner; Realistic DX-160 and DX-300 general coverage receivers, new in box; Symphonic TPS-30, 3" TV works on 115 VAC or 9 'C' cells; Sencor Big Mack Universal CRT Tester and Super Cricket transistor + FET tester; Hammarlund HQ-120 general coverage, works like new, recapped and exact calibration. Everything in excellent condition. Accepting bids on one item or all. Francis Yonker, W2IBH, 1229 Enverary Pl., State College, PA 16801 (814) 867-1400

Pair of NIB KT88 GEC tubes – will exchange for 1920s radio etc. W.H.Y.; classis Art Deco Aussie radios – A.W.A. "Empire State" including imitation marble, green healing "scales"; Red Astor Mickey, others. Will swap for early wireless gear or receiver or interesting 1920s sets. Photos available. Seeking service sheets, circuit, ads, etc. for Philco 18, Philco 112X and Sparton AC63. Lou Albert, 9 Augusta St., Warners Bay, NSW, Australia 2282

A number of very collectable radios including crystal sets and Addisons. For more info, visit my web site at: HTTP://NTFP.GLOBALSERVE.NET/ARN Andre Nolf, VE3NLF, 539 Kastelic Place, Burlington, Ontario, Canada L7N 3S9 (905) 333-4557

SELL/TRADE—LITERATURE

Pictorial and schematic photocopy of Philmore VC-1000 crystal (germanium diode) radio, $2.50 pp, USA. John Uscinowski, 95 Vly Cummit Rd., Greenwich, NY 12834-9519

Book on British Telephony by J. Atkinson, Vol. I, printed in London in 1948. Detailed account of the Telephone Exchange system of the British Post Office. Rather large book, back cover slightly watermarked, $35. plus $5. shipping. Don Maurer, 29 South 4th St., Lebanon, PA 17042 (717) 272-2481

John Baird Stock Certificates (just received) with 1930s issue dates. $150. Each. Joe Papovich, 53 Magnolia Ave., Pitman, NJ (609) 582-8279

Limited number of reprints of the original instruction manual for the DeForest D-10 receiver, $10. plus $2.50 and handling. Not many left. Don Maurer, 29 South 4 St., Lebanon, PA 17082 (717) 272-2481

Numerous manuals such as Conar, Allied/Knight, Lafayette, Eico, Paco, Precision, Hallicrafters, Howard, Hammarlund, Millen, National, WRL/Globe, Harvey-Wells, RCA, Heathkit, Johnson Viking, Ameco, Gonset, RME, B&W, Drake, Regency, Davco, Pierson, McMurdo Silver, Archer/Realistic, Polycomm, Morrow, Mosley, Multi-Elmac, B&K, Subraco, Babock, Clegg, Swan, Utica and Echophone. Al Bernard, P.O. Box 690098, Orlando, FL 32869-0098 (407) 351-5536

Large binder with Dumont RA-Model TV's RA103-RA119 and includes Dumont service information, $35.; Theory & Applications of Tubes by Herbert Reich, 2nd edition, 1944, $38.; Radio Handbook, 13th Edition, 1951, $25.; Modern Radio Servicing by Ghirardi, 1st edition, 1935, $40.; Troubleshooters Handbook by Ghirardi, 3rd edition, 1943 w/ dust jacket, $55.; Radio Physics Course by Ghirardi, 2nd edition, $30.; Fundamentals of Radio by Terman, 1st edition, 1938, $35. Donald Maurer Sr., 29 South 4th St., Lebanon, PA 17042 (717) 272-2481

The Collins Journal for the Collins users/collectors. Published bi-monthly for $20. A year. David Knepper, W3ST, POB 34, Sidman, PA 15955

SELL/TRADE—PARTS

Speakers: Rola cone Re-Creator, good coil, $100.; M.J. Carls "The Golden Bear," 4 foot folded horn, $75.; Radiola 100B, works, needs grill cloth, $50.; Victor Lumiere Loud Speaker, pleated cone, $500.; Magnavox R-3B horn (no driver) with lion roaring decal, $50.; Jensen "Concert Series" C-1058 in Argus wall cabinets, 2 for $100.; ElectroVoice "SonoCaster" 8" portable in molded case, $50.; Jensen Dynamic Speaker D-44AC in nice wood case with reprod front, $300. Chuck Bray, 1322 Ivy Rd., Bremerton, WA 98310 (360) 373-1013

SELL/TRADE—TEST GEAR

Hewlett-Packard strip chart recorder 7100B, includes inking set and one fresh paper roll, very good condition, with manual, $300.; H-P Model 310A Wave Analyzer VLF receiver, range 1 kc. Through 1.5 mc. with audio output, very good condition, with manual, $250.; H-P Model 302A Wave Analyzer ELF receiver, range 20 cps through 20 kc. Gerry Vassilatos, 590 Sheldon Ave., Staten Island, NY 10312

Allen Dumont 5" oscillograph, Model 274A, good appearance, appears to work, no leads. A piece of history. Don Maurer Sr., 29 South 4th St., Lebanon, PA 17042 (717) 272-2481

SELL/TRADE—TRANSISTOR/CRYSTAL SETS

Galena Crystal radios, super sensitive and selective in rare wood cases. L. Gardner, 458 Two Mile Creek Rd., Tonawanda, NY 14150 (716) 873-0447

Early transistor radios: French Telemonde, $70.; Soviet transistor radios Spidola, $70.; VEF 207, $70.; VEF 202, $70.; Orbitor 2, $70.; Several 1950s Philips, $50.-$85. each; 1970s sets: Soviet Beza, $55.; Telefunken multiband excellent, $70.; Tube radios: 1950s Braun excellent, mains/battery, $120.; 1940s Braun, very goood, $100.; Tesla 1940s, $70. Argirios L. Adamidis, Kampouridi 19, Panorama, Thessaloniki, Greece 55236

Transistor tabletop radios: Sears 8002 AM, $10.; RCA RLC-20 AM/FM, $10.; RCA RHC-17N AM/FM, $10.; Magnavox 10R010 AM, $12.; Americana 2220 a.c./battery AM/FM/FM stereo, $12.; Panasonic RE6451C AM/FM, $10.; Zenith Z212 AM, $10.; Masterwork M2906/3106 AM/FM a.c./battery, $10. All plus UPS shipping. Onerio Sabetto, 1717 Burgess Rd., Cleveland, OH 44112 (216)481-1036

SELL/TRADE—TUBES & TRANSISTORS

New RCA 843 (VT-73) tubes, $10. each ppd. SASE for list of over 100 antique tubes for sale/trade. Parker Heinemann, W1YG, 87 Cove Road, Lyme, CT 06371

Eimac 4-125-A, NIB, outer boxes soiled, inner boxes w/original seal, quantity 2, asking $55. each postpaid. Want Heathkit SBA-300-3 and/or SBA-300-4 VHF converters W/manuals if possible. Jim Robinson, 14 Herring Run Rd., East Sandwich, MA 02537 (508) 833-2222 or E-mail: jimr@cape.com

Type 717A tubes made by Tung Sol and Raytheon. Directly interchangeable for 6SK7, higher gain, lower noise to perk up your communications receiver or table radio, new in original boxes; Type EM80/6BR5 tubes, fluorescent "fan-type" indicator, Western European manufacture, no brand or tube type markings on tube (type is marked on each case of 200 tubes), new bulk; Type 6K7 metal tube, RCA military stock, new in clean original printed military boxes. Buy 1 or 100 or 1000 of any of the above at $3. each. Add $5. shipping per order (UPS), US funds only. Bob McTeague, 93 Milton St., Arlington, MA 02174-8734 (781) 643-3567. Out of state calls not returned, so keep trying.

New RCA tubes: 2-807, 2-866A, 1 white box JEA 6080WB, 1-6DQ5, Sell all for $45. plus $4. shipping. Will add radio amateur Q & A license guide from 1956 free. Don Maurer, 29 South 4th St., Lebanon, PA 17042 (717) 272-2481

Six new RCA 6293 tubes, $50. plus shipping or best offer. Don Maurer, 2950 4th St., Lebanon, PA 17042

74 NOS TV tubes, adj. coils and old Stromberg TV with 11" round screen. Ray Leko, POB, 102, Mespo, OH 44439 (440) 693-4338

Mullard EF50 (NIB) – large "loctal" for Canadian MK19 military set, $7.50; Mullard EF39, like 6K7G (NIB), red spray shield, $7.50; 12ZE8 eye tube, foreign, like 6E5 but 12 volt, $10.; 49 NIB CRP1005/VT195 tubes (military OZ4), with instructions for using in place of OZ4, which is simple to do, $50. for all 49; 1939 Chevrolet radio original oscillator coil in glass (GT) "tube" with octal base, have two, $20. for both; 6AF6G NIB dual eye RCA, $10. All prices firm. Jim Farago, 4017 42nd Ave., South Minneapolis, MN 55406-3528 (612) 722-0708

WANTED—COMMUNICATIONS GEAR

A power supply for my National HRO. Original preferred but will consider a suitable substitute. Bob Whipple, 3103 40th St., Lubbock, TX 79413

Communications gear, pre-war Collins gear or collectable items. Promotional items, Vibroplex presentation or Zephyr model bug. Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA 16123 (724) 758-2688

Collins equipment and parts, commercial or amateur. Not a dealer. Need not work. David Knepper, W3ST, POB34, Sidman, PA 15955 (814) 472-7826

S-meter for a Hallicrafters SX-16. Also want coil sets for HRO Senior. I'm a National man! Ron Beaver, 740 Brookdale Drive, Greer, SC 29651

WANTED—GENERAL

Want 1 tube sets and amps with name brands. Picard "Ames" amp., Doolittle Radio, "Radio Dealer" magazines, 1920s radio station verification mail. Merrill Bancroft, 169 S. Row Road, Townsend, MA 01469 (978) 597-6623

AK Model 19 in complete original condition. Also interested in other 1920 receivers that can be shipped. Roland Clark, 5 Tallaroon St., Gindalec 4074, Queensland, Australia Tel 07-3279-2884

Antique medical, scientific devices, fans, deco clocks and radios, horn phonographs. Richard Cane, 1333 N.W. 127th Dr., Sunrise, FL 33323 (954) 846 7116 fax: (954) 846-7973 E-mail: rbcane@m8.sprynet.com

Collins 51S1, GE X-371m X-372, Hallicrafters CR-3000, Ten-Tec 315, RX-10, Mosley CM-1, Heath AR(), RME 50(), RCA 1R81, Zenith 8S661, Philco 39-17, cabinet for Collins 51J4, American Bosch 440T, Collins 270G-3, speaker. Herman Schnur, 3205 Brick Kiln Rd., 27858 (252) 752-2264

RCA tube Theremin. Andrew Coleman, 8424-A Santa Monica Blvd.#233, Los Angeles, CA 90069 (213) 650-0998 fax: (213) 654-1108

Old broadcast gear, consoles, limiters, compressors, EQ, micpres, tube or solid-state, broken or working. Also microphones. Names like RCA, Gates, Collins, Western Electric, Neumann, Langevin, Altec, GE, Ampex. Thanks. Mike States, P.O. Box 81485, Fairbanks, AK 99708 phone/fax (907) 456-3419 E-mail: mstates@polarnet.com

A vintage Theremin, the electromusical instrument built around 1930 by RCA. Will be at Rochester AWA Conference in September. Anders Widell, Tinghogsvagen 60, S-22240 Lund, Sweden E-mail: Anders.Widell@mikrobiol.mas.lu.se

WANTED—INFORMATION

Need schematic and/or service infor to restore: Olympic Radio Tru-Base LP-2d3, Silvertone 9257, RCA 61-X-1 Radiola, Philco 3402, Emerson 324-2, Columbia Elect. Int'l AN/SGC 1A, Mamaroneck VOX-5 and Mamaroneck Tis-3A. Jose Antonio Jimenez Sarmiento, Camping Guantanamo s/no 35138, Tauro, Mogan, Gran Canaria, Espana Tel. 970-81-10-61

Looking for any information/reference to Pacific Electronics (perhaps a San Franscisco area company) circa WWII, and information on their merchant marine entertainment radio, Model 610A. Your help will be appreciated. Henry Engstrom, KD6KWH, P.O. Box 5846, Santa Ros, CA 95402 phone/fax (707) 544-5179

Need schematic and manual for National Co. SW-58 and One-ten A receivers. Will pay expenses. J.B. Santos, Rua Julia Cortines, 67, Sao Paulo, Brazil 04279

Info on Pilotone Universal -– 5 sets in one kit including 3 tube shortwave. Circa 1926. Radio used UX201A's and believe it may be Pilot's first kit. Joseph Kelber, 503 S. Scranton Ave., Scranton, KS 66537 (785) 793-2323

Need schematic and alignment info on a Sears Wayfarer, Model 8227 and the same for Zenith Transoceanics series 1000 and 3000. Also need schematics and calibration info on the following test equipment: General Radio Oscillator Model 1310-B, RCA Voltohmyst VTVM, Jetronics VTVM model 710 (ME 26B/U), Westmore Tube Analyzer, Model 501 (any info on this), Heathkit Sig. Tracer Model IT-12 (any info). R. Rawliuk, Box 317, Nenana, AK 99760

WANTED—KEYS AND TELEGRAPH

Your no longer used Vibroplex bug with narrow base (3 inches or less), Zephyr, Presentation or McElroy bug. Brian Roberts, K9VKY, 130 Tara Dr., Fombell, PA 16123 (724) 758-2688

Unusual bugs (speed keys) especially Brown Bros. Model CSA, Wheatstone Research Go-Devel, Hunter Apex, Codetrol, Vibroplex or McElroy Midgets, any vertical, right angle or left-handed models. Any oddball bugs welcome. I will be at Rochester to give slide presentation. Gil Schlehman, 335 Indianapolis Ave., Downers Grove, IL 60515 (630) 968-2320

WANTED—LITERATURE

Literature on early radio control - looking for copies of Miniature Auto Racing and catalogs. Also 1960s and earlier radio control cars, Dynamic Models, Cox, Jerobee and boats. David Gibbons, 3225 W. 29th Ave., Denver, CO 80211-3705 (303) 477-6822

Complete manuals (original or copies) for Hickock Traceometer 156, Meissner Analyst, Gonset Communicator III, Gonset Tribander Converter. I also need drawings and/or advice on restringing "color ray" indicator dial system of Midwest 20-38. Marc Ellis, P.O. Box 1306, Evanston, IL 60204-1306; ellis@interaccess.com; (847) 869-5016.

WANTED—MILITARY

Zenith 6S222, Military BC-652, BC-653, SSR-1. Gary Cain, P.O. Box 521, Shakopee, MN 55379

WANTED—PARTS

Need the following tubes for restoration and operation of 1920s and 1930s amateur transmitters: Taylor globe shape 866 JR with ceramic bases, Sylvania 830B's with ceramic bases, Sylvania 210T's with ceramic bases, and Eimac 75TH's. Will purchase outright or trade for UV-200, UV-201A, UV-199, WD-11, WD-12, WE 215A, etc. SASE for list of tubes for trade or sale. Thank you. Parker Heinemann, W1YG, 87 Cove Rd., Lyme, CT 06371

Philco station stop wrench, part number 45-2475, for concentric tuning. Jim Regan, P.O. Box 880752, San Francisco, CA 94188 (415) 397-4134

Knob for a green Bendix Catalin radio Model 526C. Terry Ernsberger, 15655 CR40, Goshen, IN 46528

Amplion horn speaker (willing to pay top dollar). Bill Jewell, 3800 Ridgehaven Rd., Fort Worth, TX 76116 (817) 377-4664 E-mail: OldRadios@aol.com

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Need cabinet for Emerson model 547. Also looking for Admiral 1-F flyback 79D138-18 and 1-79D166-3. James Maloney, 1703 Leno R.D., Macedon, NY 14502

Splitdorf Model R-500 antenna coil. Looks like a spider web. Also interstage transformer, which drives the high resistance speaker voice coil. I wish to thank everyone that helped to get my Splitdorf and low band aircraft receivers working. William Mitch, 668 West 725 South, Hebron, IN 46341 (219) 996-3313

Needed for restoration – the original clock for Zenith Model T-522W and the knobs, clock part no. S-22552, knob part no. 46-1307 and 46-1312. Also need schematic diagram for National Model HRO-5T. Jose A. Jimenez Sarmiento, Camping Guantanamo, S/N 35138, Tauro-Morgan, Gran Canaria, Spain

WANTED—TUBES & TRANSISTORS

Old triodes 50/250, 45/245, 2A3 single-plated, Speed 295, WE101D, WE205D/E, WE211D/E, WE252A, WE284D, WE300A/B, WE350B, other radio tubes and WE transformers. Please send list. Masakazu Nishida, 5-15-505, Hinode, Urayasu-shi, Chiba, 279-0013 Japan fax: (011) 81-47350-1621 e-mail: nishida@mitsukoshi.co.jp

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DeForest 433 through 440 receiving tubes. Duds acceptable. John H. Walker, Jr., 16112 W. 125th St., Olathe, KS 66062 (913) 782-6455 E-mail: johnh.walker@alliedsignal.com

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Western Electric: No. 7-A amplifier, No.2-A current supply, No. 25-B amplifier, any model loud speaking telephones, tubes: 101D, 102D/E/G, 104D, 205D/E, 212D/E, 216A, 217A, 252A, 253A, 262A/B, 300A, 417A, 437A, tube sockets. Ming Yang, 346 Donald Drive, Morgan, CA 94556 (925) 376-4220 fax: (925) 376-8861

DeForest Audion, Fleming Valves, magnetrons LMS, Derk Rouwhorst, Postbus 24, Delden, Holland fax: 01131 74 376 3132 E-mail: info@amplimo.nl

the 90s with networked PCs. This small network was installed to preserve the integrity of the collection data base by defining one master location but allowing access at several locations. An ultimate goal is to allow searching of the museum data base by members over the AWA web-site.

Other activity includes a complete rearrangement of the stored amateur and military equipment. The need was created by a large acquisition of such equipment, especially that of the George Helmer family. This donation of over 25 pieces was arranged for, and transported by, Tim Walker. And just in case you think all is fun and games at the museum work sessions, I want you to know that last week's big adventure was digging out the top of the septic tank to seal the extension tube against ground water ingress. Exciting stuff!

Be sure to plan a museum visit while attending the conference, and look elsewhere in this issue for details on an exciting operating event—the recreation of the first 2-way transatlantic QSO.

Warmest regards,

Ed Gable K2MP/W2AN
Curator, AWA Museum

RECENT MUSEUM DONORS

Paul Paxton KN2UND
AM Stereo Tuner, rare

Herb Haddleton WA2MST
AMRAD Superhet, Radiola III, Crosley 51, more

Marjorie Edmeston
RCA 19K, Victrola VV4-7

Charles Gramm KB4ZB
Craftsman RC10

Charles Miller
HQ-170, Sherwood S5500, more

Ben Wild
Pair Altec Lansing A-7 Voice of Theater

Ron Bishop
Knight R100

James Mozley W2BCH
TG-34 Keyer

John Maha K2ZUT
R-392, T-195, more

George Helmer (Family)
25 pcs Ham and Broadcast radios

Rochester Amateur Radio Assn.
SX-101A, CE-100V, Heath Apache, more

Sheldon Kane
Jackson Tube tester

Henry O'Meara WB2NRX
13 Radio Boys *(Chapman) with jackets*

Brad Wilson W1AY
DC to DC converter, early Handbook

Mani Pires
Kodavision Camcorder

SILENT KEYS

We record the passing of the following AWA members with deep regret.

PAUL DILLON, W5GT

JOHN L. GLISSON

JOHN L. KELLY, N3GVF (EX W9OHX)

ALEXANDER ANDERSON MCKENZIE, II*

STANLEY A. STROMSWOLD

PHIL WEINGARTEN

*See also listing in Recent Radio, TV and Entertainer Obituaries.

Note: AWA officers and members are requested to submit all information about Silent Keys, with or without special recognition, to Joyce Peckham, Secretary, Box E, Breesport, NY 14816. This will help in the collection, coordination and appropriate recognition of both AWA members and others who have made contributions to the electronics and entertainment industries.

OTB BACK ISSUES

The following back issues of *The Old Timer's Bulletin* are available at $3.00 each postpaid, with a 20 percent discount for six or more issues and 30 percent off for 12 or more. The nine special-theme issues contain the normal columns and news, plus a core of features on a particular topic area. The number of special-focus pages in each issue is listed below. Index to *OTB* volumes 20-34 and *The AWA Review* Volumes 1-8 is free on request with purchase. Please indicate alternative choices when ordering back issues of *OTB*.

VOLUME AND NUMBER

26-3 Nation FB7 II/Radio in S. Africa/Mercury Super 10/ Building a 1929 Receiver
26-4 Gilfillan History I/ Sargent Model 11 Receiver
27-1 Gilfillan History II/Schickerling Tubes
28-1 Dynergy AC-Powered Radio/Pilot TC37 TV
28-2 '26 Radiomovies Today/National AGS I
28-3 Dowd Tube Collection/National AGS II
28-4 SE-1950 Radio Compass/National Sliding-Coil Receivers/Collecting Radio Batteries
29-1 Philco 17 Restoration/ZL2JJ '34 Station
29-2 Fada 460 Restoration/3ZO 1922 Station
29-3 Moorhead Tubes I/British '30s TV I
29-4 Moorhead tubes II/British '30s TV II
30-1 GE Octagon TV Set/TR-1 Transistor Clones
30-3 Military Equipment Special-17 pgs. of 48
30-4 Broadcast Receiver Special-12 pgs. of 48
31-3 Tube Special-19 pgs. of 48
31-4 International Special-11 pgs. of 48
32-4 Marconi V-24 Valve/HRO in British Army
33-2 40th Anniversary Special ("Best of *OTB* 1960-1982") all 48 pgs. incl. RCA Metal Tubes
33-4 Scott Special Rcvr/National power Units
34-1 British crystal Sets/National Power Units
34-3 International Special II-20 pgs. of 64
34-4 Bell Labs Transistor Set/"Larkspur" Radios
35-1 Radiola and Aerola Grand/German WWII Magnetrons & Avionics/Tech-Manual Art
35-2 Van Horne Tube Co./Philco TV Designers/Foreign "HROs"/1200- and 1600-series tubes
35-3 Radiola 17 and 18/1929 regen/G&R Valve Co.
35-4 Negatron/Mercury Super 10/The Breting 14/James Millen Memorial Station
36-1 Orrin Dunlap's Lab/Kolster K23/Bush & Lane Radio
36-2 Headset Update Listing
36-3 100 Years of Marconi Radio
36-4 History of Rogers Batteryless Receivers
37-1 T.V.-Dr. Ernest Alexanderson, Part 1
37-2 T.V.-Dr. Ernest Alexanderson, Part 2
37-3 Evolution of the Auto Radio, Part 1
37-4 Reginald A. Fessenden and the Development of Radiotelephony
38-1 The Atwater Kents That Never Were!
38-2 DeForest Gang Hits Colorado-Part1/Nathan Stubblefield-Forgotten Pioneer of Wireless-Part1

Cut or photocopy and mail to address below:

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Please send the following volumes of *The AWA Review* (Price postpaid in US and Canada. $13 for one volume; $23 for two; $33 for three ($14.50, $24.50, or $34.50 elsewhere):

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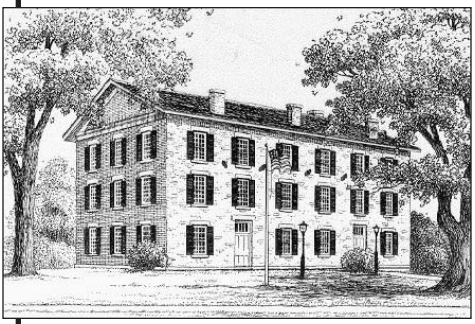
Please make checks payable to AWA.
Mail to: Edward M. Gable, 187 Lighthouse Rd., Hilton, NY 14468

THE MUSEUM

Visit our Internet web site: http://www.ggw.org/awa

AWA Electronic Communication Museum



FREE ADMISSION

Location: Village Green, Rts. 5 & 20, Bloomfield, NY.

Hours: May 1 through Oct. 31—Sunday 2-5 p.m.; June 1 through Aug. 31—Saturday 2-4 p.m.; July 1 through Aug. 31—Wednesday 7-9 p.m. (Closed holidays.)

Group Tours: By appointment.

Museum Telephone: (716) 657-6260

Amateur Station: W2AN

Curator: Ed Gable

Mailing Address:
Ed Gable, Curator, AWA Museum,
187 Lighthouse Rd., Hilton, NY 14468

Museum News

After a much needed spring cleaning and sprucing up, your museum opened on schedule for the season. This year the Wednesday evening opening was eliminated due to lack of attendance and the loss of Bruce Kelley, who almost exclusively held reign on this night. Attendance has been good and two special "standing room only" group tours had the old floors creaking in spots.

New displays include a SWL corner where visitors can sit down and leisurely tune a Hallicrafters SX-62A. Many people are amazed to hear world-wide news on 15 MHz coming through as well as any local station. Also new in the 1925 radio store is a book section where people could come in and buy a copy of the latest *Radio Boys* series by Chapman or Breckenridge. A special thanks goes out to AWA member Henry O'Meara, WB2NRX, who donated his fine collection of dust-jacketed Chapman books.

I am pleased to report that donations continue to come into the collection at a nice rate and the quality of donated items is very good. Let me restate that the policy and goal of the AWA museum is to preserve and protect historical artifacts for current and future study and documentation by communications historians.

To that end, the museum library continues to be a resource for AWA researchers and historians and we're glad to help as we can. The library resources are the next items to be inventoried, catalogued and placed onto the AWA data base. A huge effort to be sure, but well worth the time involved.

The Annex is likewise busting out with activity. A new copying machine has replaced the 25-year-old Xerox job which just could no longer be massaged back into life. We're also into

(continued on page 70)